CMSC436: Programming Handheld Systems

The Intent Class

Today’s Topics

- The Intent Class
- Starting Activities with Intents
  - Explicit Activation
  - Implicit Activation via Intent resolution

The Intent Class

A data structure that represents

- An operation to be performed, or
- An event that has occurred

Today’s Focus

Using Intents to specify operations to be performed

- i.e., using Intents to start a single activity

We’ll cover using Intents for event notification when we talk about BroadcastReceivers

Intents Identify a Desired Operation

Intents provide a flexible “language” for specifying operations to be performed

- e.g., I want to pick a contact, take a photo, dial a phone number, etc.

Intents Identify a Desired Operation

An Intent is constructed by one component that wants some work done

It is delivered to another component that offers to perform that work

Intent Fields

Action

Data

Category

Type

Component

Extras

Flags

Action

String representing the desired operation

Platform-Defined Examples

ACTION_DIAL – Dial a number

ACTION_EDIT – Display data to edit

ACTION_SYNC – Synchronize device data with a server

ACTION_MAIN – Start as initial activity of app

Setting the Intent Action

```
Intent newInt = new Intent(Intent.ACTION_DIAL);
```

Or

```
Intent newInt = new Intent();
newInt.setAction(Intent.ACTION_DIAL);
```

Data

Data associated with the Intent

Formatted as a Uniform Resource Identifier (URI)

Examples

Data to view on a map

```
Uri.parse(“geo:0,0?q=1600+Pennsylvania
                                +Ave+Washington+DC”)
```

Number to dial in the phone dialer

```
Uri.parse(“tel:+15555555555”)
```

Setting Intent Data

```
Intent intent= new Intent (Intent.ACTION_DIAL,
                           Uri.parse("tel:+15555555555"));
```

Or

```
Intent intent = new Intent(Intent.ACTION_DIAL);

intent.setData(Uri.parse("tel:+15555555555"));
```

Category

Additional information about the components that are allowed to handle the Intent

Examples

CATEGORY_BROWSABLE – Activity can be invoked to display data ref’s by a URI

CATEGORY_LAUNCHER – can be the initial Activity of a task and is listed in top-level app launcher

Type

Specifies an explicit MIME type of the Intent data

Examples

- image/*, image/png, image/jpeg
- text/html, text/plain

If unspecified, Android will infer the type

Component

The component that should receive this Intent

Use this when there’s exactly one named component that should receive the intent

Setting the component

```
Intent intent = Intent(Context packageContext,
                       Class<?> cls);
```

Setting the component

Or

Intent intent = new Intent ();

and one of:

setComponent(), setClass(), or setClassName()

Extra

Additional information associated with Intent

Treated as a map (key-value pairs)

Intent.EXTRA_EMAIL: Email Recipient List

```
Intent intent = new Intent(Intent.ACTION_SEND);
intent.putExtra(android.content.Intent.EXTRA_EMAIL,
  new String[]{
            “aporter@cs.umd.edu”, “ceo@microsoft.com”,
             “potus@whitehouse.gov”,“mozart@musician.org”
            }
);
```

Setting the Extra Attribute

Several forms depending on data type

putExtra(String name, String value);

putExtra(String name, float[] value);

…

Flags

Specify how Intent should be handled

Examples

FLAG_ACTIVITY_NO_HISTORY

Don’t put this Activity in the History stack

FLAG_DEBUG_LOG_RESOLUTION

Print extra logging information when this Intent is processed

Setting Flags

```
Intent intent =
        new Intent(Intent.ACTION_SEND);

intent.setFlags(
    Intent.FLAG_ACTIVITY_NO_HISTORY);
```

Starting Activities with Intents

startActivity(Intent intent,…)

startActivityForResult(Intent intent, …)

The Target Activity

Can be named explicitly by setting the Intent’s component

Otherwise, it is determined implicitly

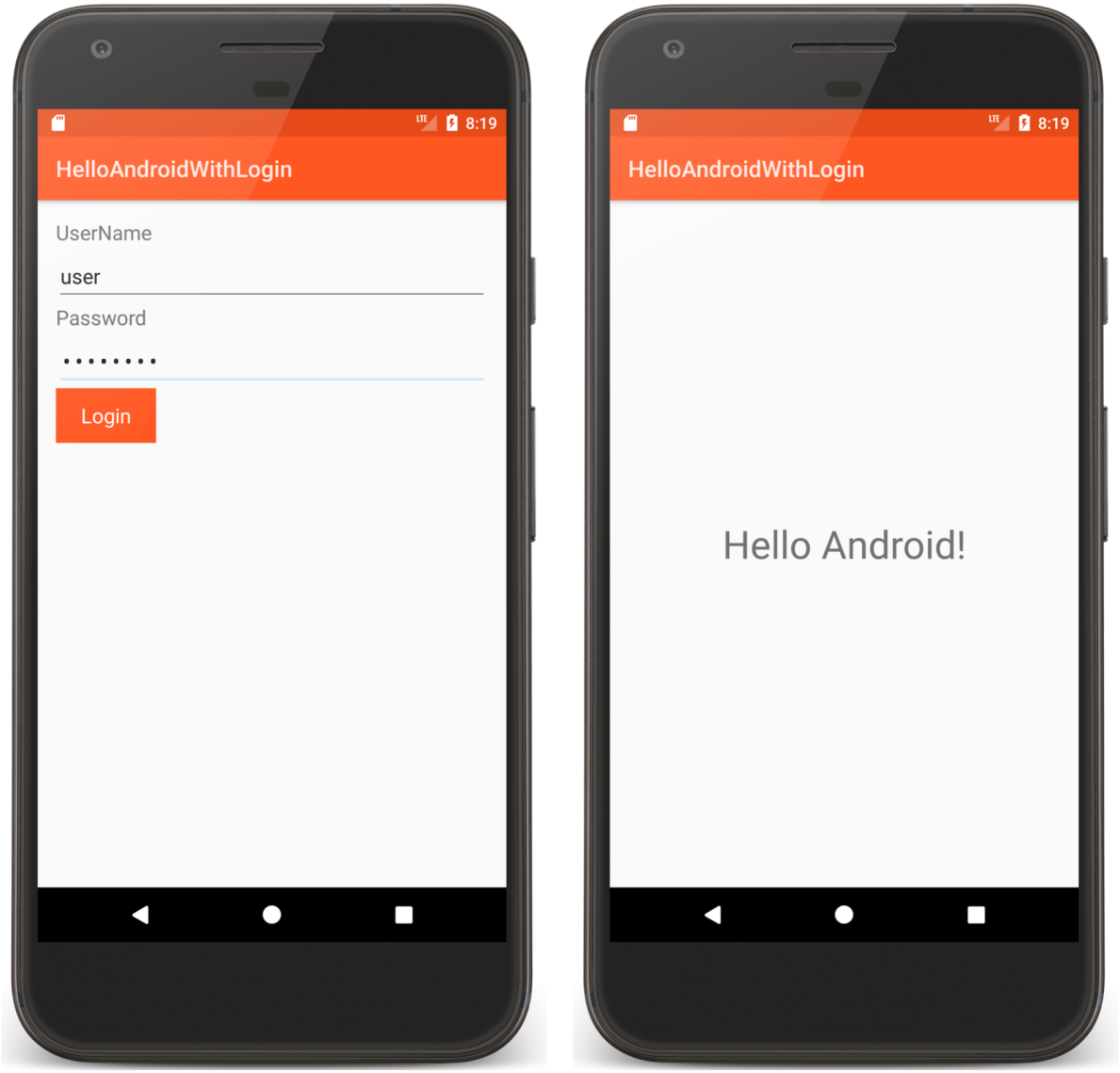
Explicit Activation

HelloWorldWithLogin

Two Activities

- LoginActivity checks username & password and then starts HelloAndroidActivity
- HelloAndroidActivity shows “Hello Android!” message

HelloAndroid WithLogin



```
public class LoginScreen extends Activity {
   @Override
   public void onCreate(Bundle savedInstanceState) {
      …
      final Button loginButton = findViewById(R.id.login_button);
      loginButton.setOnClickListener(new OnClickListener() {
         public void onClick(View v) {
            if( /* authorized */) {

               // Create an explicit Intent for starting the HelloAndroid Activity
               Intent helloAndroidIntent = new Intent(LoginScreen.this, HelloAndroid.class);

               // Use the Intent to start the HelloAndroid Activity
               startActivity(helloAndroidIntent);

            } …
```

Implicit Activation

When the Activity to be started is not explicitly named, Android tries to find Activities that match the Intent

This process is called Intent Resolution

Intent Resolution Process

An Intent describing a desired operation

IntentFilters describe which operations an Activity can handle

- IntentFilters specified in AndroidManifest.xml or programmatically

Intent Resolution Data

Action

Data (both URI & Type)

Category

Specifying IntentFilters

```
<activity …>
    …
    <intent-filter …>
      …
      <action android:name=”actionName" />
      …
    </intent-filter>
    …
</activity>
```

Handling Intent.ACTION_DIAL

```
<activity …>
    …
    <intent-filter …>
      …
      <action android:name=”android.intent.action.DIAL" />
      …
    </intent-filter>
    …
</activity>
```

Adding Data to IntentFilter

```
<intent-filter …>
    …
    <data
        android:mimeType="string”
        android:scheme="string"
        android:host="string"
        android:port="string"
        android:path="string"
        android:pathPattern="string"
        android:pathPrefix="string"
    />
    …
</intent-filter>
```

Handling geo: Scheme Intents

```
<intent-filter …>
    …
    <data android:scheme=”geo" />
    …
</intent-filter>
```

Adding a Category to an IntentFilter

```
<intent-filter …>
    …
    <category android:name="string" />
    …
</intent-filter>
```

Example: Maps Application

```
<intent-filter …>
    <action android:name ="android.intent.action.VIEW" />
    <category android:name ="android.intent.category.DEFAULT" />
    <category android:name="android.intent.category.BROWSABLE”/>
    <data android:scheme ="geo”/>
</intent-filter>
```

Receiving Implicit Intents

Note: to receive implicit intents an Activity should specify an IntentFilter with the category

"android.intent.category.DEFAULT”

Priority

android:priority – Priority given to the parent component when handling matching Intents

Causes Android to prefer one activity over another

-1000 <= priority <=1000

Higher values represent higher priorities

Using Implicit Intents

The MapLocation app created an implicit Intent and then used it in a call to startActivity()

What if the user has uninstalled the Maps app?

Your code should always check before attempting to start an Activity with an implicit Intent

```
...
// Create Intent object for starting Google Maps application
Intent geoIntent = new Intent(android.content.Intent.ACTION_VIEW,
                                        Uri .parse("geo:0,0?q=" + address));
// Check that there is at least one Activity to handle the implicit Intent
if (getPackageManager().resolveActivity(geoIntent, 0) != null) {
   // Use the Intent to start Google Maps application using Activity.startActivity()
   startActivity(geoIntent);
}
...
```

Using Implicit Intents

Implicit Intents can pose a security hazard

Prefer explicit Intents within your own app

Set the android:exported attribute to false in AndroidManifest.xml if you don’t want other apps to start a given component in your app

Investigate Intent Filters

% adb shell dumpsys package

```
      1761a23 com.google.android.gm/.Gmail2PreferenceActivity
    comgooglewallet:
      551fb20 com.google.android.gms/.tapandpay.tokenization.AddNewCardThroughBrowserActivity
    :
      4b70c8a com.google.android.apps.photos/.pager.HostPhotoPagerActivity
      b0349a9 com.google.android.calendar/.ICalLauncher (4 filters)
    geo:
      b1dd765 com.google.android.apps.maps/com.google.android.maps.MapsActivity
    mms:
      92bdcd9 com.google.android.talk/com.google.android.apps.hangouts.phone.BabelHomeActivity
      d06357f com.example.android.apis/.os.MmsMessagingDemo
      dcd569e com.google.android.apps.messaging/.ui.conversation.LaunchConversationActivity
    sip:
      12d683 com.android.phone/.PrivilegedOutgoingCallBroadcaster
      1b37000 com.android.server.telecom/.components.UserCallActivity
      586e039 com.android.server.telecom/.PrivilegedCallActivity
      647ad3d com.android.phone/.OutgoingCallBroadcaster
      7d5067e com.android.server.telecom/.EmergencyCallActivity
      d7b8932 com.android.phone/.EmergencyOutgoingCallBroadcaster
    sms:
      73ac3a com.android.fallback/.Fallback
      92bdcd9 com.google.android.talk/com.google.android.apps.hangouts.phone.BabelHomeActivity
      dcd569e com.google.android.apps.messaging/.ui.conversation.LaunchConversationActivity
      f2ba94c com.example.android.apis/.os.SmsMessagingDemo
    tel:
      12d683 com.android.phone/.PrivilegedOutgoingCallBroadcaster
      1b37000 com.android.server.telecom/.components.UserCallActivity
-uu-:---F1  dumpsys.out.txt    4% L592   (Text Isearch)----------------------------------------------------
I-search: geo
```

Next

Permissions

Example Applications

HelloAndroidWithLogin