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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 for 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

```
val newIntent = Intent(Intent.ACTION_DIAL)
```

Or

```
val newIntent = Intent()
newIntent.action = 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

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

Or

```
val intent = Intent(Intent.ACTION_DIAL)
intent.data = 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 referenced 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

```
val intent = Intent(packageContext: Context!,
                    cls: Class<*>!
```

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

```
val intent = Intent(Intent.ACTION_SEND)
intent.putExtra(Intent.EXTRA_EMAIL,
        arrayOf(“aporter@cs.umd.edu”,
                  “ceo@microsoft.com”,
                  “potus@whitehouse.gov”,
                  “mozart@musician.org”))
```

Setting the Extra Attribute

Several forms depending on data type

```
putExtra(name: String!, value: String?);
putExtra(name: String!, value: FloatArray?);
…
```

Flags

Specify additional information on how Intent should be handled

Examples

FLAG_ACTIVITY_NO_HISTORY

- Don’t put this Activity in the Task backstack

FLAG_DEBUG_LOG_RESOLUTION

- Print extra logging information when this Intent is processed

Setting Flags

```
val intent = Intent(Intent.ACTION_SEND)
intent.flags =
        Intent.FLAG_ACTIVITY_NO_HISTORY
```

Starting Activities with Intents

```
fun startActivity(intent: Intent!): Unit

fun startActivityForResult(intent: Intent!,
                        requestCode: Int): Unit
```

The Target Activity

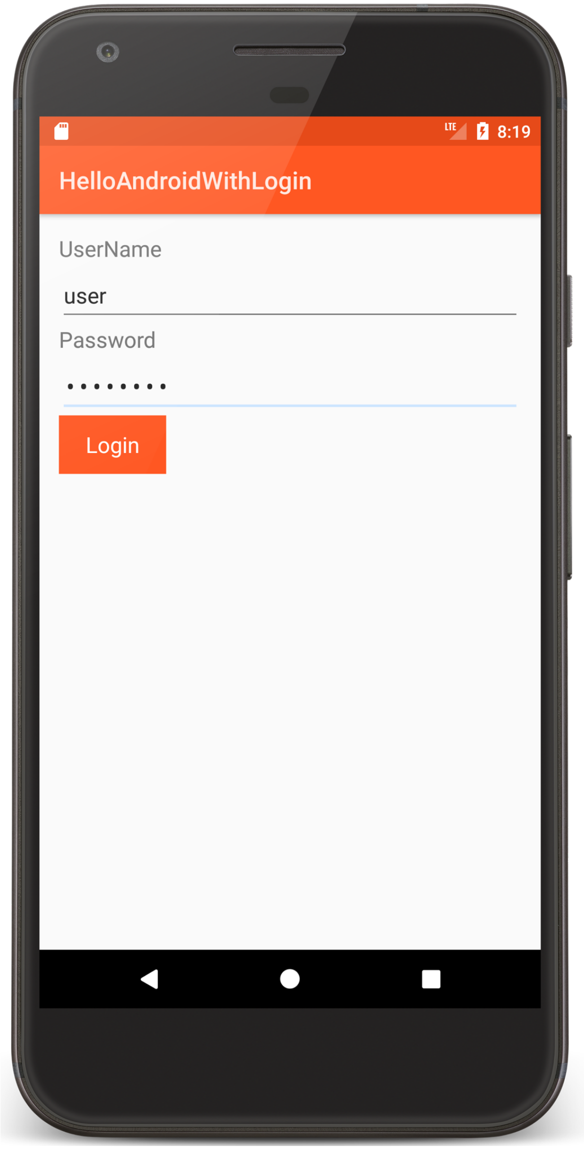
Can be named ***explicitly*** by setting the Intent’s component

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



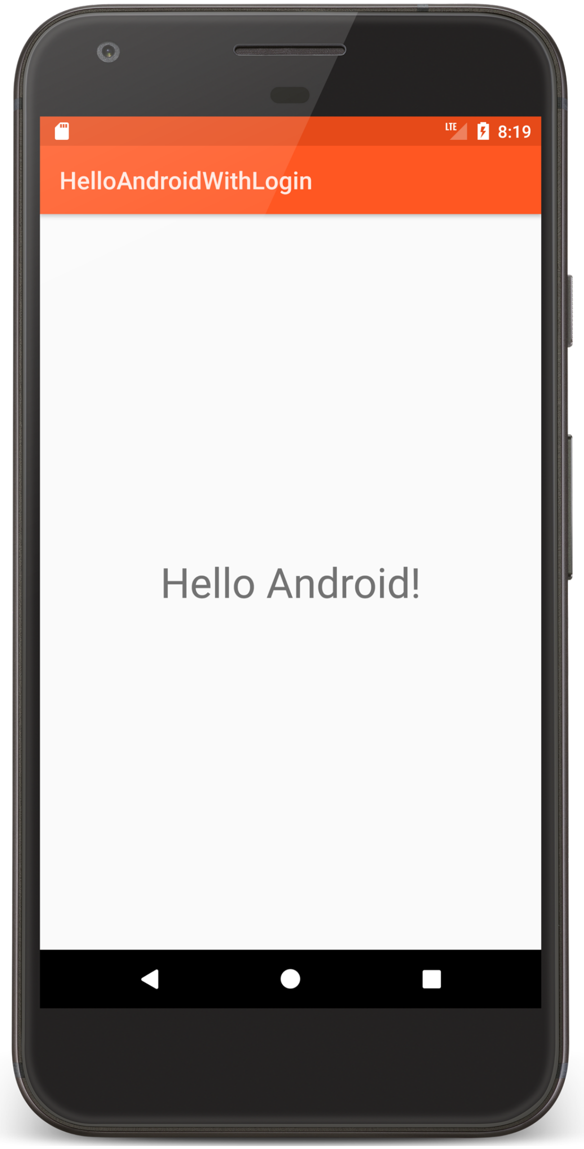
HelloAndroidWithLogin

UserName

user

Password

••••••••



HelloAndroidWithLogin

Hello Android!

LoginScreen.kt

```
fun onClick(v: View?) {
    if (/* authorized */) {
   // Create an explicit Intent for starting the
  // HelloAndroid Activity
        val helloAndroidIntent = Intent(
            this@LoginScreen,
            HelloAndroid::class.java)

  // 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 information contained in the Intent

This process is called Intent Resolution

Intent Resolution Process

Intents describe desired operations

IntentFilters describe which operations a given Activity can handle

- IntentFilters specified in AndroidManifest.xml or programmatically

Intent Resolution Data

Action

Type (includes data)

Categories

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()

Should start a Maps app

What if the user has uninstalled all Maps apps?

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

MapLocation.kt

```
private fun processClick() {
    try {
      …
     // Create Intent object for starting Google Maps application
       val geoIntent = Intent(
                Intent.ACTION_VIEW, Uri
                .parse("geo:0,0?q=$address"))

       geoIntent.resolveActivity(packageManager)?.let {
                   startActivity(geoIntent)
       }
…
```

Using Implicit Intents

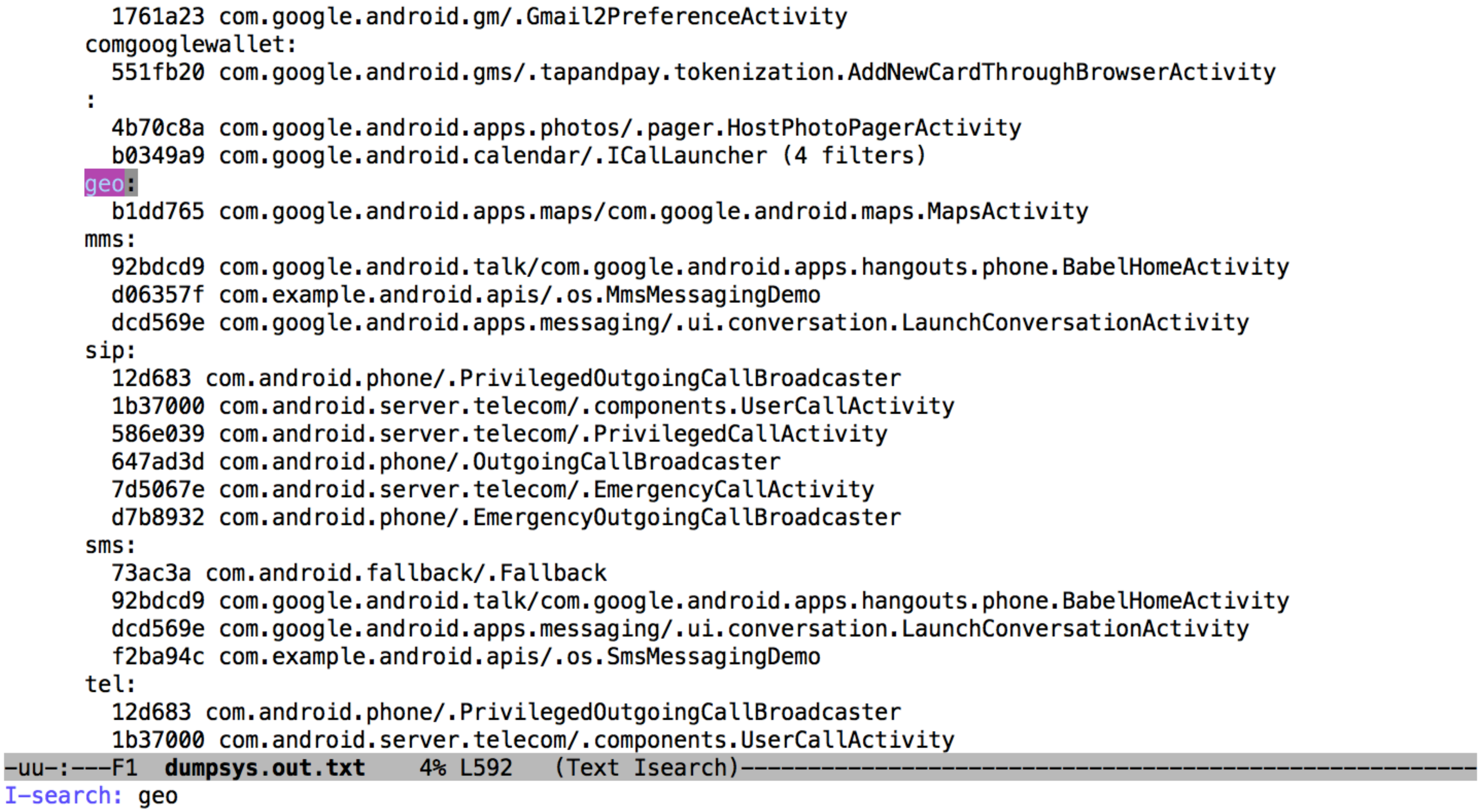
Implicit Intents can pose a security hazard

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