CMSC436: Programming Handheld Systems

Permissions

Today’s Topics

Android permissions

Defining and using permissions

Component permissions and related APIs

Permissions

Permissions protects resources and data

For instance, they limit access to:

- User information – e.g., Contacts
- Cost-sensitive API’s – e.g., SMS/MMS
- System resources – e.g., Camera

Permissions

Permissions are represented as strings

Apps describe relevant permissions in AndroidManifest.xml, including

- Permissions they use
- Permissions required of components that want to interact with them

Using Permissions

Applications specify permissions they use through a <uses-permission> tag

These permissions must be granted before access is allowed

Apps must check at runtime that all required permissions have been granted

Using Permissions

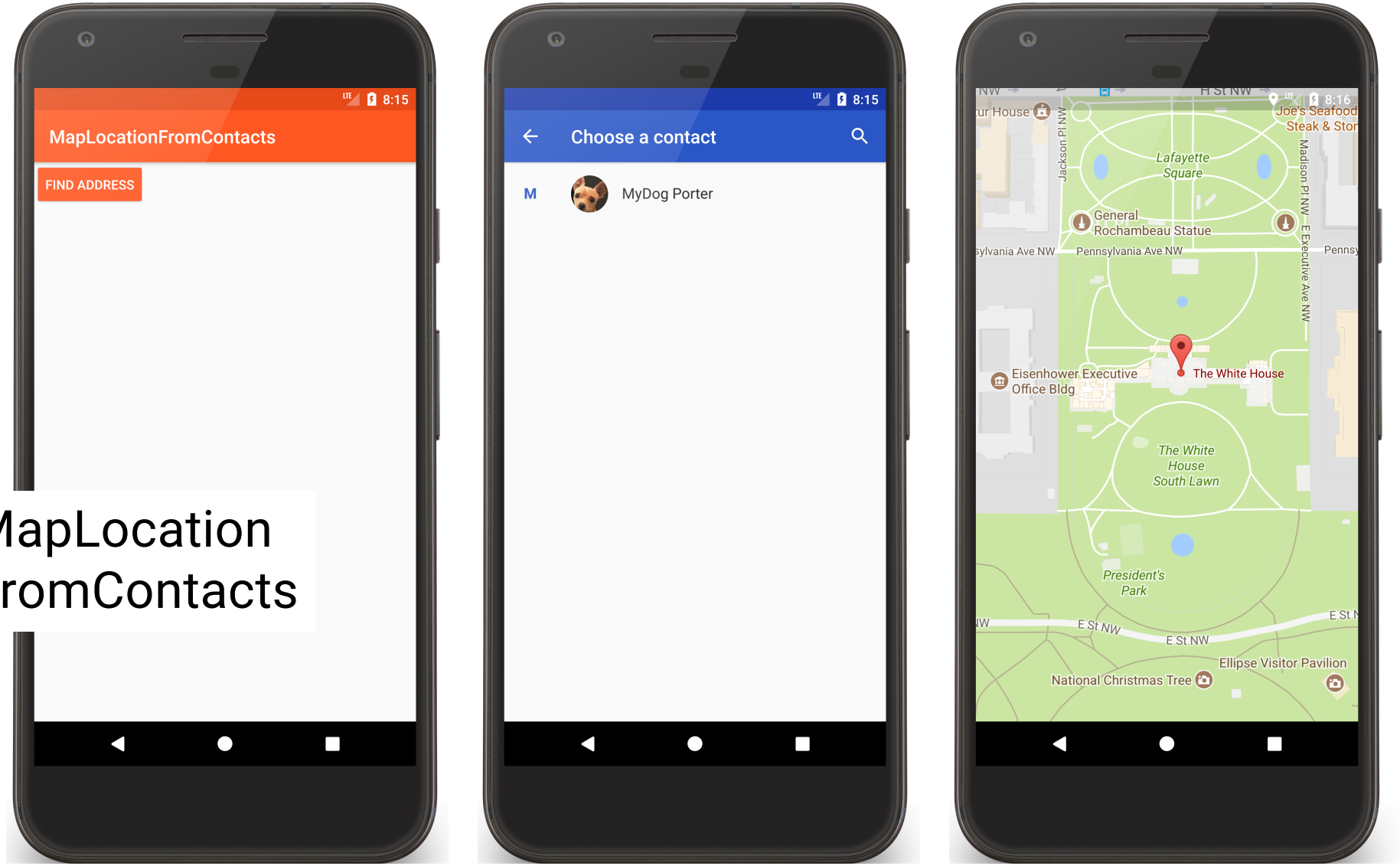
```
<manifest … >
…
<uses-permission  android:name="android.permission.CAMERA”/>
<uses-permission  android:name="android.permission.INTERNET”/>
<uses-permission
        android:name=“android.permission.ACCESS_FINE_LOCATION”/>
…
</manifest >
```

See: https://developer.android.com/training/permissions/index.html

MapLocationFromContacts

Selects a contact from contacts database

Displays a map centered on selected contact’s address



MapLocation FromContacts

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
   package="course.examples.maplocationfromcontacts"
   …" >

   <uses-permission android:name="android.permission.READ_CONTACTS" />

   <application
      android:allowBackup="false"
      android:icon="@mipmap/ic_launcher"
      android:label="MapLocationFromContacts"
      android:theme="@style/MaterialTheme">
      <activity
         android:name="MapLocationFromContactsActivity"
         android:label="MapLocationFromContacts" >
         …
      </activity>
   </application>
</manifest>
```

MapLocationFromContactsActivity.kt

```
private fun getContact() {
    // Step 1: Ensure permissions
    if (!hasPermission && needsRuntimePermission()) {
        requestPermissions(arrayOf(READ_CONTACTS_PERM),
                                    PERMISSIONS_PICK_CONTACT_REQUEST)
    } else {
        startContactsApp()
    }
}

private fun needsRuntimePermission(): Boolean {
  // Check the SDK version and whether the permission is already granted.
    return Build.VERSION.SDK_INT >= Build.VERSION_CODES.M &&
        checkSelfPermission(READ_CONTACTS_PERM) !=
                                                PackageManager.PERMISSION_GRANTED
}
```

MapLocationFromContactsActivity.kt

```
override fun onRequestPermissionsResult( requestCode: Int,
                permissions: Array<String>,grantResults: IntArray){
 if (requestCode == PERMISSIONS_PICK_CONTACT_REQUEST) {
    if (grantResults[0] == PackageManager.PERMISSION_GRANTED) {
            // Permission is granted
            hasPermission = true
            startContactsApp()
        } else {
            Toast.makeText(this, "… access to your contact list",
                                            Toast.LENGTH_SHORT).show()
        }
    }
}
```

Defining Permissions

Apps can also define and enforce their own permissions

Defining Permissions

Suppose your application performs a potentially dangerous operation

You might not want to allow just any application to invoke yours

So you can define & enforce your own permission

PermissionExampleBoom

Simple Application that performs a (pretend) dangerous action


10:10
PermissionExampleBoom
BOOM!

Define & Enforcing Permissions

You don’t want just application to run PermissionExampleBoom

Define & enforce an application-specific permission

AndroidManifest.xml

```
<!-- Defines a custom permission -->
<permission
    android:name="course.examples.permissionexample.BOOM_PERM"
    android:description="@string/boom_perm_string"
    android:label="@string/boom_permission_label_string"
    android:protectionLevel="dangerous" />


<!--
Enforces the BOOM_PERM permission on users of this application
-->
<application
    android:allowBackup="false"
    android:icon="@mipmap/ic_launcher"
    android:label="@string/app_name"
    android:permission="course.examples.permissionexample.BOOM_PERM"
    androidd:theme="@style/MaterialTheme">
    …
```

ProtectionLevel

Normal – Low risk

System automatically grants permission

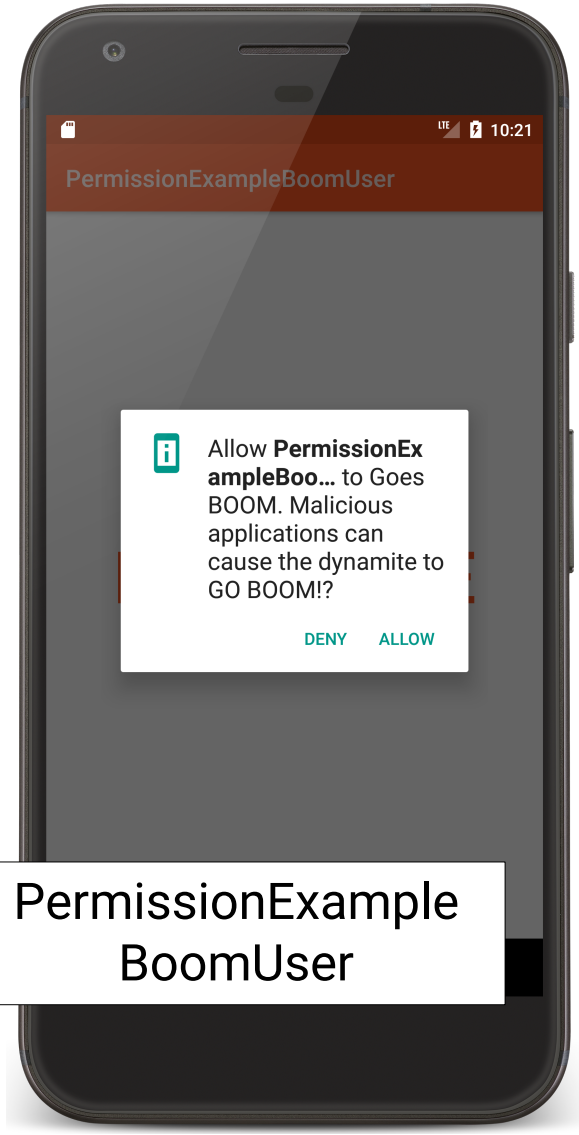
Dangerous– High risk

User must explicitly grant permission

Using the Permission

Apps that want to use PermissionExampleBoom must acquire the required permission

PermissionExampleBoom



PermissionExample BoomUser

Uses-Permission

Application declares permissions required by other Applications it uses

AndroidManifest.xml

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

    <!--  App needs the "...BOOM_PERM permission -->
    <uses-permission
      android:name="course.examples.permissionexample.BOOM_PERM" />
```

Component Permissions

Individual components can set their own permissions, restricting which other components can access them

Component permissions take precedence over application-level permissions

Activity Permissions

Restricts which components can start the associated Activity

Checked within execution of

- startActivity()
- startActivityForResult()

Throws SecurityException on permissions failure

Service Permissions

Restricts which components can start or bind to the associated service

Checked within execution of

- Context.startService()
- Context.stopService()
- Context.bindService()

Throws SecurityException on permissions failure

BroadcastReceiver Permissions

Restricts which components can send & receive broadcasts

Permissions checked in multiple places

More on this when we discuss BroadcastReceivers

ContentProvider Permissions

Restrict which components can read & write the data in a ContentProvider

More on this when we discuss ContentProviders

Next

The Fragment Class

Example Applications

MapLocationFromContacts

PermissionBoom

PermissionBoomUser