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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
MapLocationFromContacts
<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>
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 {
            // ... access to your contact list
            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
Define & Enforcing Permissions

You don’t want just any 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"
    android: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
PermissionExampleBoomUser

PermissionExampleBoomUser

PermissionExampleBoom

PermissionExampleBoomUser

PermissionExampleBoomUser

PermissionExampleBoom

PermissionExampleBoom

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PermissionExampleBoom

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PermissionExampleBoomUser

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PermissionExampleBoom

PermissionExampleBoomUser

PermissionExampleBoom

PermissionExampleBoom

PermissionExampleBoomUser

PermissionExampleBoom

PermissionExampleBoom
Uses-Permission

Application declares that it needs permissions required by other Applications it uses
<?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" />

</manifest>
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