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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

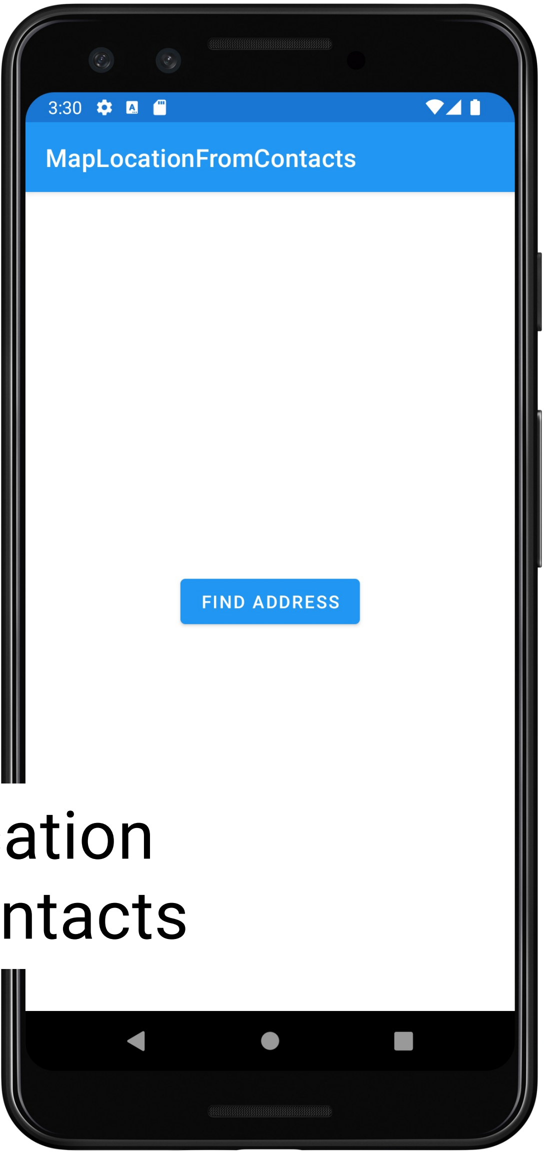
MapLocationFromContacts

Selects a contact from contacts database

Displays a map centered on selected contact’s address

Requires permissions to read user’s contacts db

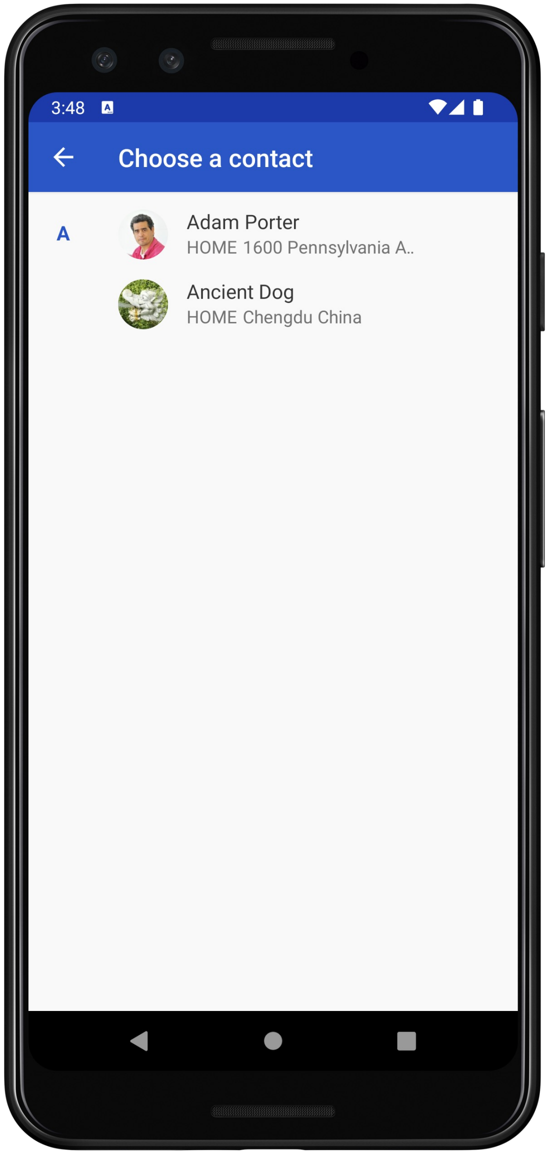
MapLocation FromContacts



3:30

MapLocationFromContacts

FIND ADDRESS



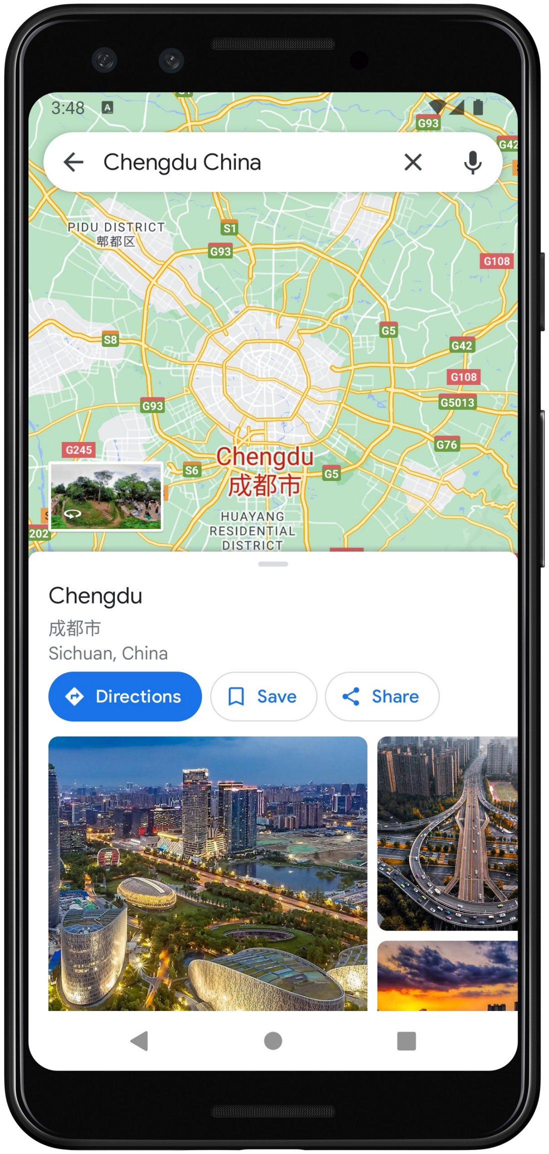
3:48

Choose a contact

A

Adam Porter
HOME 1600 Pennsylvania A..

Ancient Dog
HOME Chengdu China



3:48

Chengdu China

Chengdu
成都市
Sichuan, China

Directions

Save

Share

Permission Granting Recipe

Check whether permissions have been granted

If not, check whether user has previously denied permission

- Can try to explain the need for this permission and possibly ask user to grant permission

If user has not been asked for permission, do so now

See: MapLocationFromContacts

ActivityResultCaller.registerForActivityResult()

Example use case

Define ActivityResultLauncher<String> instance

- This instance calls registerForActivityResult(), passing in necessary callback info
- This info involves requestPermission() or requestMultiplePermissions() contract interface object

Call ActivityResultLauncher<String>.launch(intent) to request desired permissions

- Registered callback is started when permission request returns

Defining Permissions

Apps can also define and enforce their own permissions

Defining Permissions

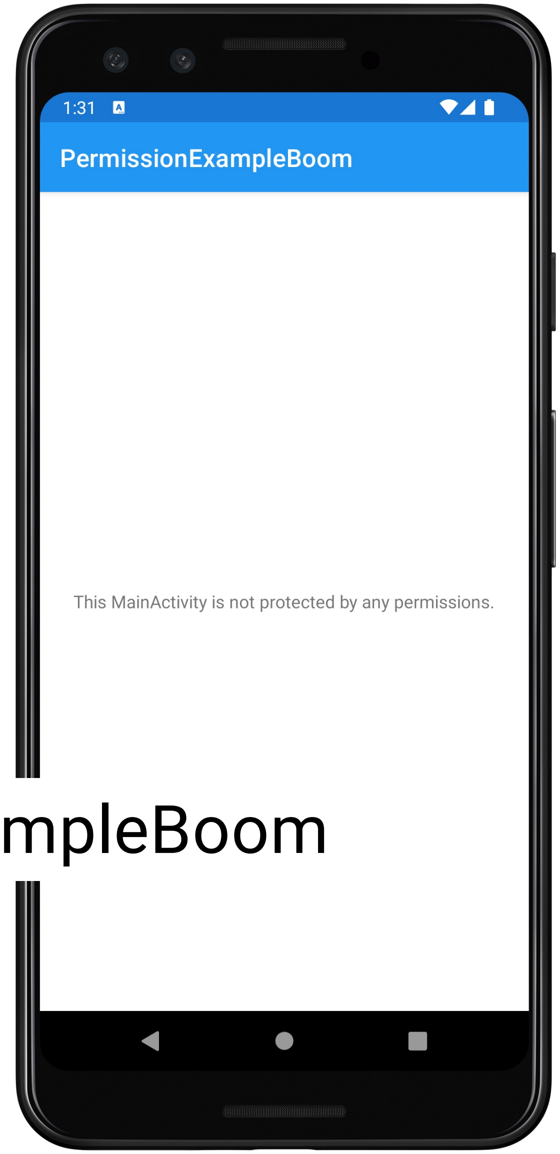
Suppose your application performs a potentially dangerous operation

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

- Android lets you define & enforce your own permissions

PermissionExampleBoom

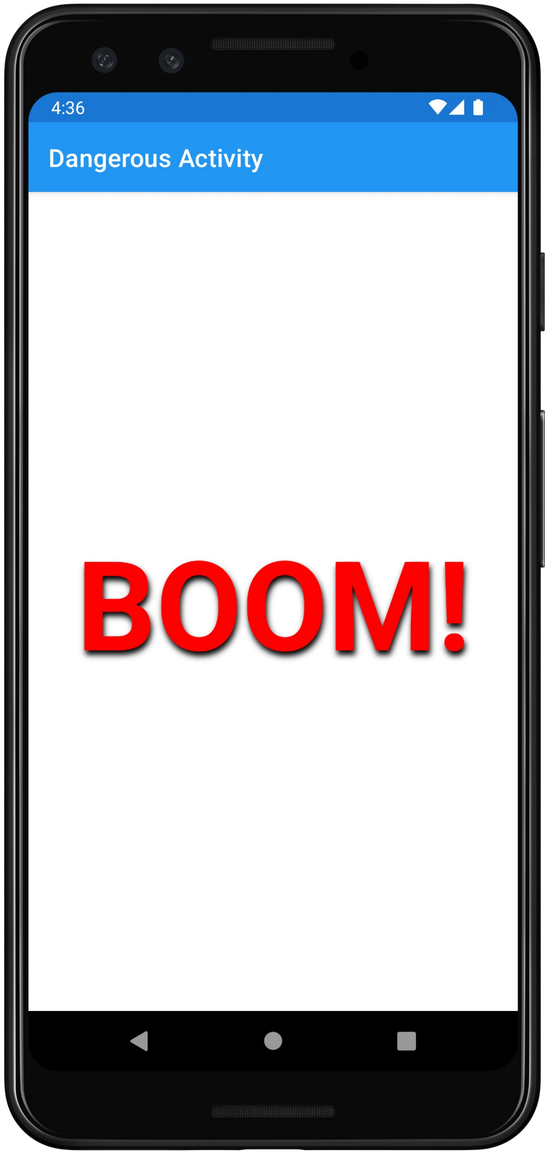
Simple Application that performs a (pretend) dangerous action



PermissionExampleBoom

This MainActivity is not protected by any permissions.

PermissionExampleBoom



Dangerous Activity

BOOM!

Define & Enforcing Permissions

You don’t want just any application to run PermissionExampleBoom

Define & enforce an application-specific permission

AndroidManifest.xml

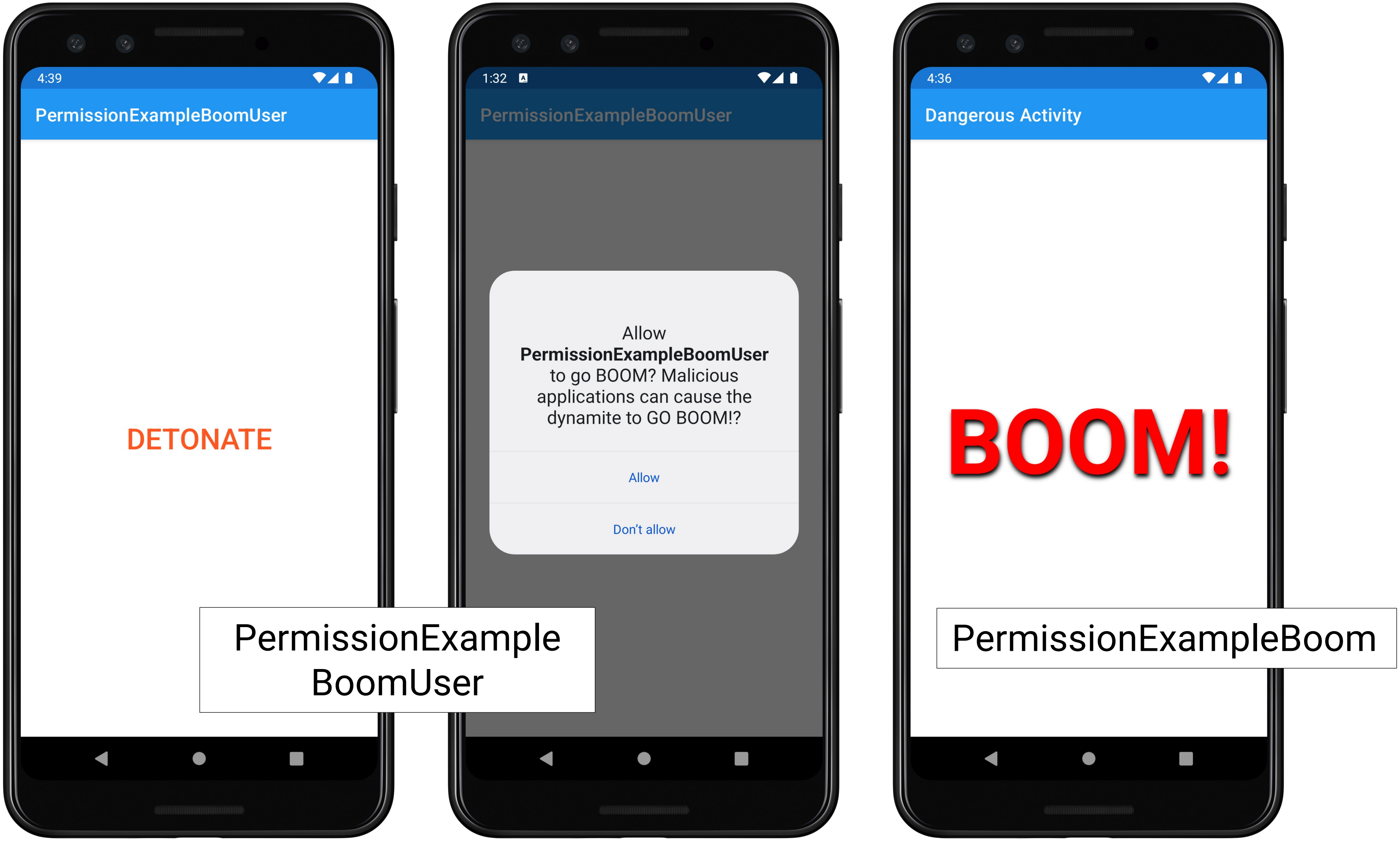
```xml
<!-- Defines a custom permission -->
<permission
    android:name="course.examples.permissionexample.BOOM_PERM"
    android:description="@string/boom_perm_string"
    android:label="@string/boom_permission_label_string"
    android:protectionLevel="dangerous" />


<!--
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



Allow **PermissionExampleBoomUser** to go BOOM? Malicious applications can cause the dynamite to GO BOOM!?

PermissionExample BoomUser

PermissionExampleBoom

Uses-Permission

Application declares that it needs permissions required by other Applications it uses

AndroidManifest.xml

```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

DataManagement

Example Applications

MapLocationFromContacts

PermissionBoom

PermissionBoomUser