JÖNKÖPING UNIVERSITY

School of Engineering

ANDROID CONTENT PROVIDERS

Peter Larsson-Green

Jönköping University

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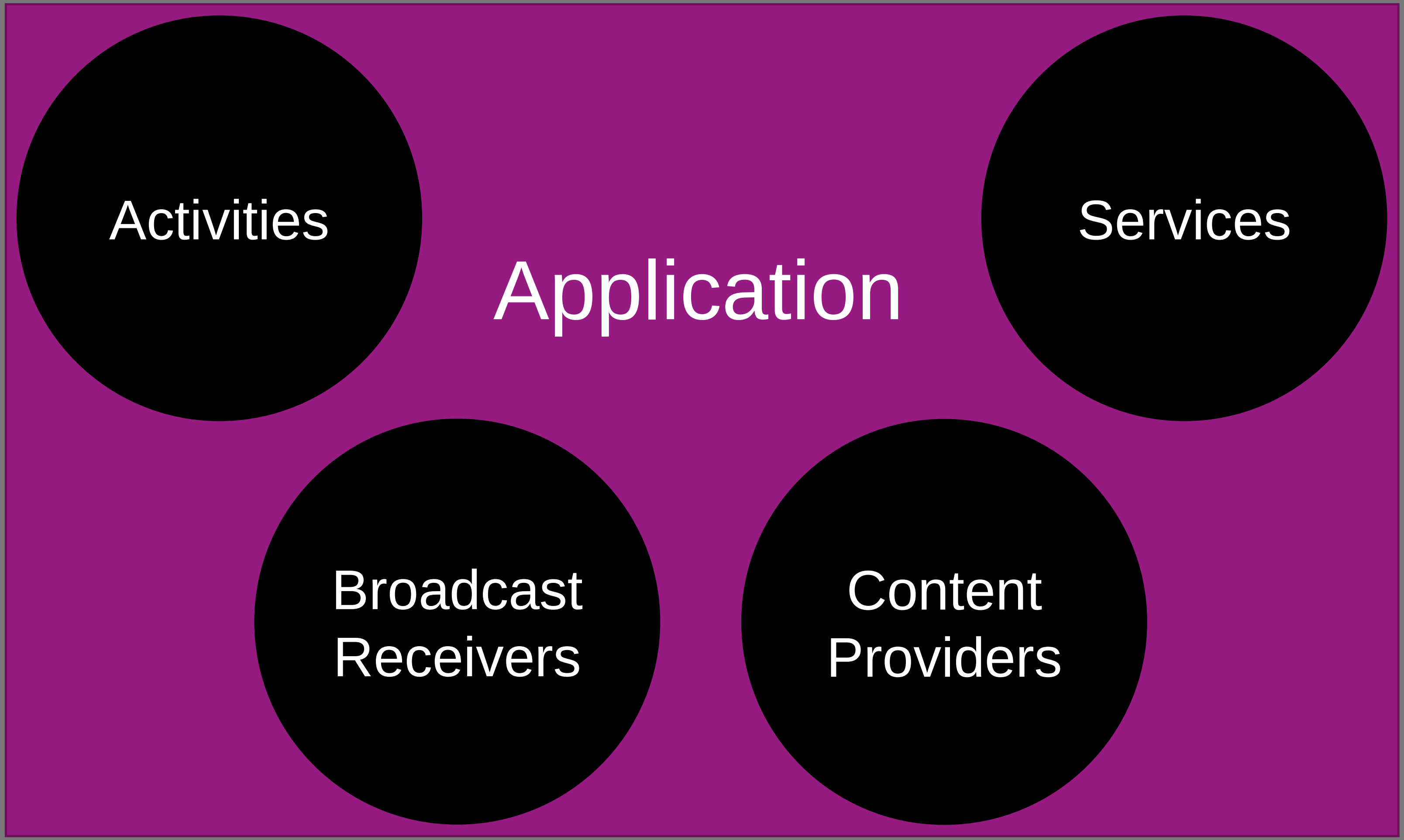
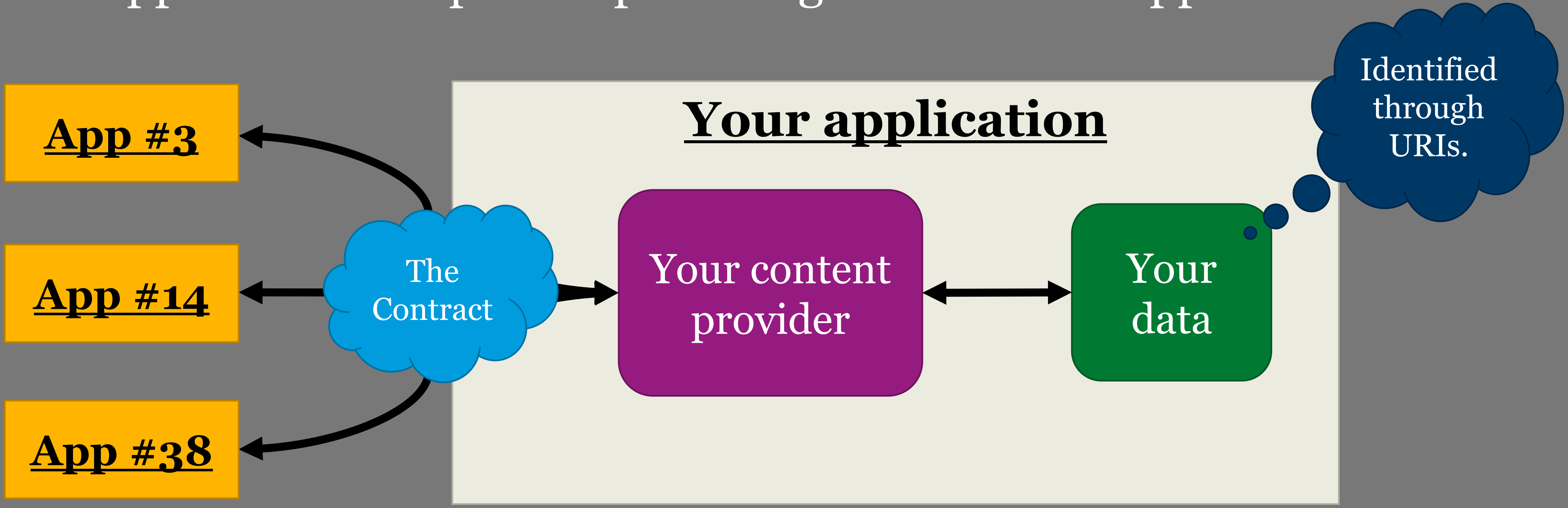
FUNDAMENTAL APP COMPONENTS



WHAT'S A CONTENT PROVIDER?

An application component providing data to other applications.



WHAT'S A CONTENT PROVIDER?

An application component providing data to other applications.

- In theory, the data can be stored in any way.
- In practice, it is easy to use data from SQLite.

HOW DO I USE A CONTENT PROVIDER?

```
ContentResolver contentResolver = aContext.getContentResolver();
```

```
contentResolver.query(theUri, ...);
```

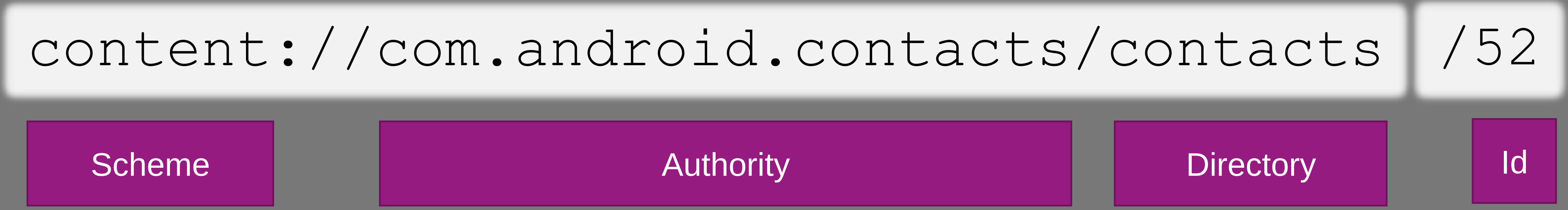
```
contentResolver.insert(theUri, ...);
```

```
contentResolver.update(theUri, ...);
```

```
contentResolver.delete(theUri, ...);
```

THE URI FOR CONTENT PROVIDERS

Identifies data in providers.



```
content://com.android.contacts/contacts /52
```

Useful methods:

```java
Uri uri = Uri.parse("content://authority/collection");
Uri uri2 = ContentUris.withAppendedId(uri, 37);
long id = ContentUris.parseId(uri2);
```

READING DATA

```
contentResolver.query(
  theUri,
  theProjection,
  theSelection,
  theSelectionArgs,
  sortOrder
);
```

```
contentResolver.query(
  Uri.parse("content://com.android.contacts/contacts"),
  new String[]{ "display_name" },
  "display_name = ?",
  new String[]{ "Edsger W. Dijkstra" },
  "display_name DESC"
);
```

Don't hardcode the strings, use the contract instead!

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

READING DATA

```
Cursor cursor = contentResolver.query(...);

int count = cursor.getCount();

while(cursor.moveToNext()){
  String aString = cursor.getString(0);
  int aNumber = cursor.getInt(1);
}

cursor.close();
```

INSERTING DATA

```
ContentValues values = new ContentValues();
values.put("theColumn", theValue);

Uri uri = contentResolver.insert(
  theUri,
  values
);
```

UPDATING DATA

```
ContentValues values = new ContentValues();
values.put("theColumn", theValue);

int numberOfAffectedRows = contentResolver.update(
  theUri,
  values,
  selection,
  selectionArgs
);
```

DELETING DATA

```java
int numberOfAffectedRows = contentResolver.delete(
  theUri,
  selection,
  selectionArgs
);
```

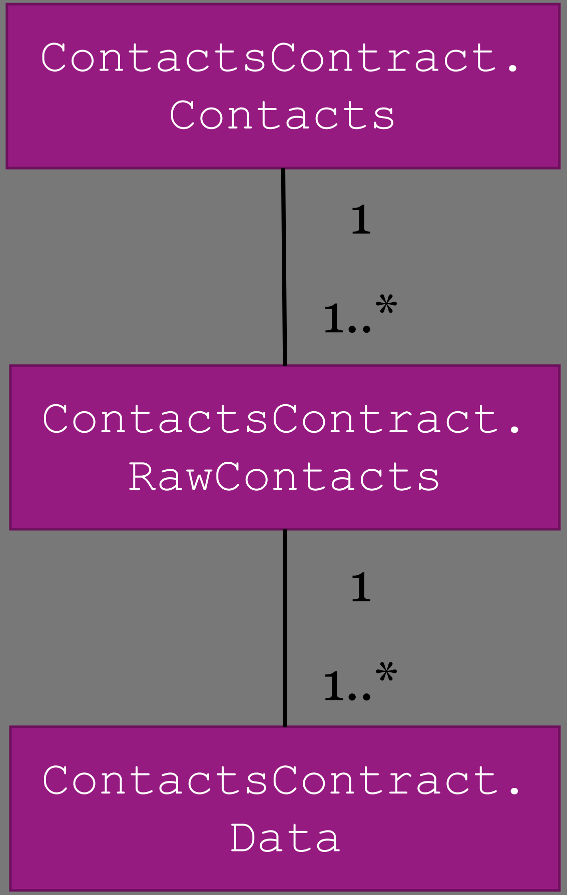
LISTENING FOR DATA CHANGES

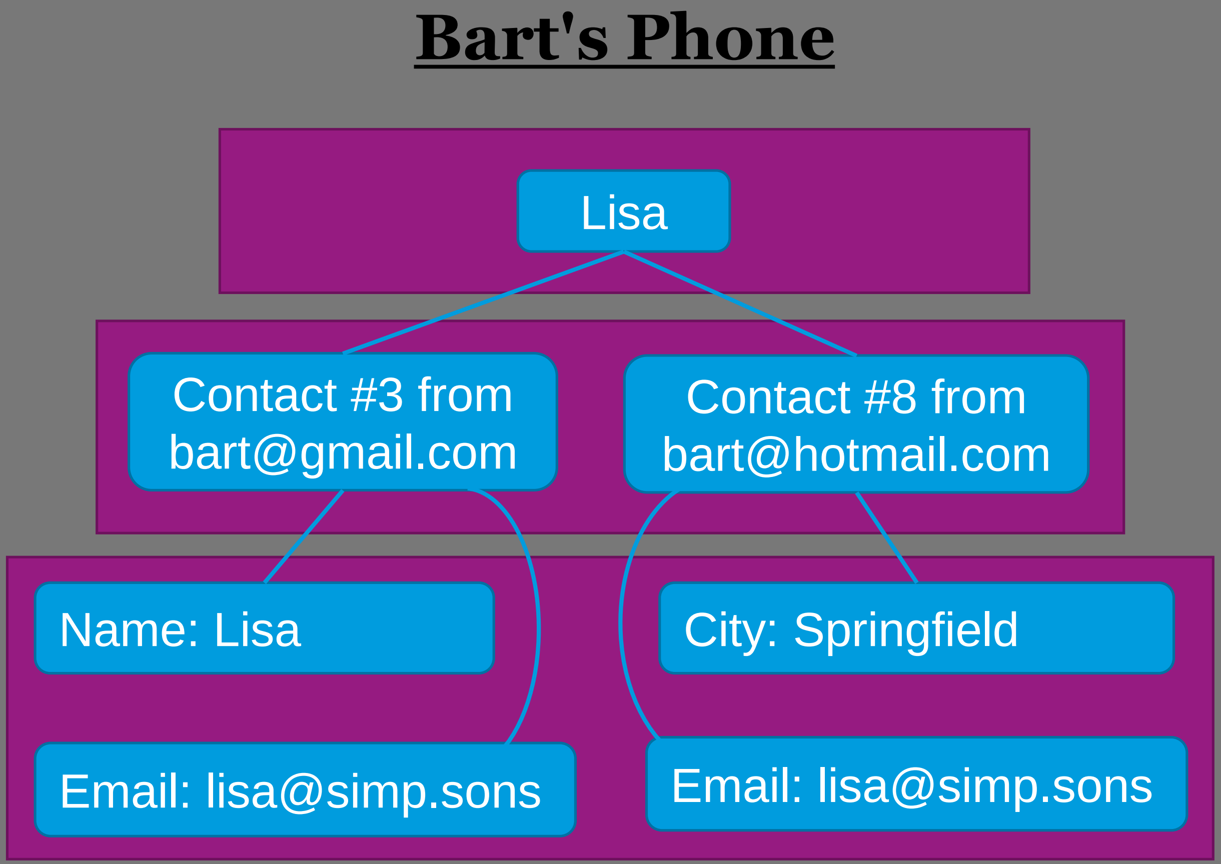
```
ContentObserver yourContentObserver = new ContentObserver(){
  public ContentObserver(){ super(new Handler()); }
  public void onChange(boolean selfChange){ }          /* API L <= 15 */
  public void onChange(boolean selfChange, Uri uri){ } /* 16 <= API L */
};
contentResolver.registerContentObserver(
  theUri,
  false,
  yourContentObserver
);
```

`false` = exact URI.
`true` = exact URI + children

```
contentResolver.unregisterContentObserver(yourContentObserver);
```

HOW CONTACTS ARE ORGANIZED





CONTACT PROVIDER'S CONTRACT

```
ContactsContract.Contacts.CONTENT_URI
ContactsContract.Contacts._ID,
ContactsContract.Contacts.DISPLAY_NAME

ContactsContract.CommonDataKinds.Phone.CONTENT_URI
ContactsContract.CommonDataKinds.Phone.NUMBER
ContactsContract.CommonDataKinds.Phone.CONTACT_ID

ContactsContract.CommonDataKinds.Email.CONTENT_URI
ContactsContract.CommonDataKinds.Email.ADDRESS
ContactsContract.CommonDataKinds.Email.CONTACT_ID
```

CREATING A CONTENT PROVIDER

```xml
<manifest package="the.package">
  <application ...>
    <provider
      android:name=".MyContentProvider"
      android:authorities="the.package.MyContentProvider"
      android:exported="true"
      android:readPermission="a.permission"
      android:writePermission="a.permission"
    />
  </application>
</manifest>
```

CREATING A CONTENT PROVIDER

```
public class MyContentProvider extends ContentProvider{
   @Override
   public boolean onCreate(){
      return true;
   }
}
```

Did everything go well?

CREATING A CONTENT PROVIDER

```
public class MyContentProvider extends ContentProvider{
  public Cursor query(Uri uri, String[] projection, String selection,
                              String[] selectionArgs, String sortOrder){}
  public Uri insert(Uri uri, ContentValues values){}
  public int delete(Uri uri, String selection, String[] selectionArgs){}
  public int update(Uri uri, ContentValues values, String selection,
                                           String[] selectionArgs){}
}
```

These methods must be thread safe!

CREATING A CONTENT PROVIDER

```
public class MyContentProvider extends ContentProvider{
   @Override
   public String getType(Uri uri){
      if(/* uri points to collection */){
        return "vnd.android.cursor.dir/vnd.package.name";
      }else{
        return "vnd.android.cursor.item/vnd.package.name";
      }
}
```

ContentResolver.
CURSOR_DIR_BASE_TYPE

ContentResolver.
CURSOR_ITEM_BASE_TYPE

THE URI MATCHER

Zero or more digits.

```
UriMatcher matcher = new UriMatcher(UriMatcher.NO_MATCH);
matcher.addURI("the.authority", "the/path", 1);
matcher.addURI("the.authority", "the/path-2", 2);
matcher.addURI("the.authority", "the/path/#", 3);
matcher.addURI("the.authority", "the/path-2/*", 4);

Uri uri = Uri.parse("content://the.authority/the/path-2");
int two = matcher.match(uri);
```

Zero or more characters.

PATTERN FOR NOTIFYING CHANGES

Use content providers to notify changes.

- Need to properly implement `query`, `insert`, `update` & `delete`.
- To work properly, data may only be changed through these methods on the content provider.
  - In fragments/activities, work with the data through the content provider.

NOTIFYING CHANGES

```
public class MyContentProvider extends ContentPrivider{
  public Uri insert(Uri uri, ContentValues values){
    // Do the insertion...
    getContext().getContentResolver().notifyChange(
      theUri,
      theContentObserver
    );
  }
}
```

In many cases `null`.

PROVIDING FILES

Content providers can also provide read and write streams to files.

```
ContentResolver contentResolver = aContext.getContentResolver();
```

```
InputStream is = contentResolver.openInputStream(theUri);
```

```
OutputStream os = contentResolver.openOutputStream(theUri, "w");
```

In your content provider, override:

```
openFile(Uri uri, String mode)
```

ADDING A FILE PROVIDER

```
<manifest package="the.package">
  <application ...>
      <provider
        android:name="android.support.v4.content.FileProvider"
        android:authorities="se.ju.larpet.fileprovider"
        android:exported="false"
        android:grantUriPermissions="true">
          <meta-data
            android:name="android.support.FILE_PROVIDER_PATHS"
            android:resource="@xml/file_provider_paths"></meta-data>
      </provider>
  </application>
</manifest>
```

ADDING A FILE PROVIDER

```
<manifest package="the.package">
  <application ...>
      <provider
        android:name="android.support.v4.content.FileProvider"
        andro
        andro
        andro
          <me
            android:name="android.support.FILE_PROVIDER_PATHS"
            android:resource="@xml/file_provider_paths"></meta-data>
      </provider>
  </application>
</manifest>
```

```
<?xml version="1.0" encoding="utf-8"?>
<paths>
  <external-files-path name="pics" path="cars/" />
</paths>
```

Part of URI other apps see.

Actual sub directory.

EXAMPLE: TAKING PICTURE

```
Intent intent = new Intent(MediaStore.ACTION_IMAGE_CAPTURE);
File folder = aContext.getExternalFilesDir(null);
File file = new File(folder, "cars/my-file.jpeg");
Uri fileUri = FileProvider.getUriForFile(
  aContext,
  "se.ju.larpet.fileprovider",
  file
);
intent.putExtra(MediaStore.EXTRA_OUTPUT, fileUri);
intent.setClipData(ClipData.newRawUri("", fileUri));
intent.addFlags(Intent.FLAG_GRANT_WRITE_URI_PERMISSION);
startActivityForResult(intent, 123);
```

You need a file provider giving the camera app an output stream.