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The ContentProvider Class

Today's Topics

ContentProvider

ContentResolver

CursorLoader

Implementing ContentProviders

ContentProvider

Represents a repository of structured data

Encapsulates data sets

Enforces data access permissions

ContentProvider

Intended for inter-application data sharing

Clients access ContentProviders through a
ContentResolver

ContentResolver

Presents a database-style interface for reading & writing data

query, insert, update, delete, etc.

Provides additional services such as change notification

ContentResolver

Get reference to ContentResolver by calling
`Context.getContentResolver()`

ContentProvider & ContentResolver

Together these classes let code running in one process access data managed by another process

Android ContentProviders

Browser – bookmarks, history

Call log- telephone usage

Contacts – contact data

Media – media database

UserDictionary – database for predictive spelling

Many more

ContentProvider Data Model

Data represented logically as database tables

_ID	artist
13	Lady Gaga
44	Frank Sinatra
45	Elvis Presley
53	Barbara Streisand

URI

ContentProviders referenced by URIs

The format of the URI identifies specific data sets managed by specific ContentProviders

Format

content://authority/path/id

content – scheme indicating data that is managed by a content provider

authority – id for the content provider

path – 0 or more segments indicating the type of data to be accessed

id – a specific record being requested

Example: Contacts URI

```
ContactsContract.Contacts.CONTENT_URI =  
    "content://com.android.contacts/contacts/"
```

ContentResolver.query()

Returns a Cursor for iterating over a results set

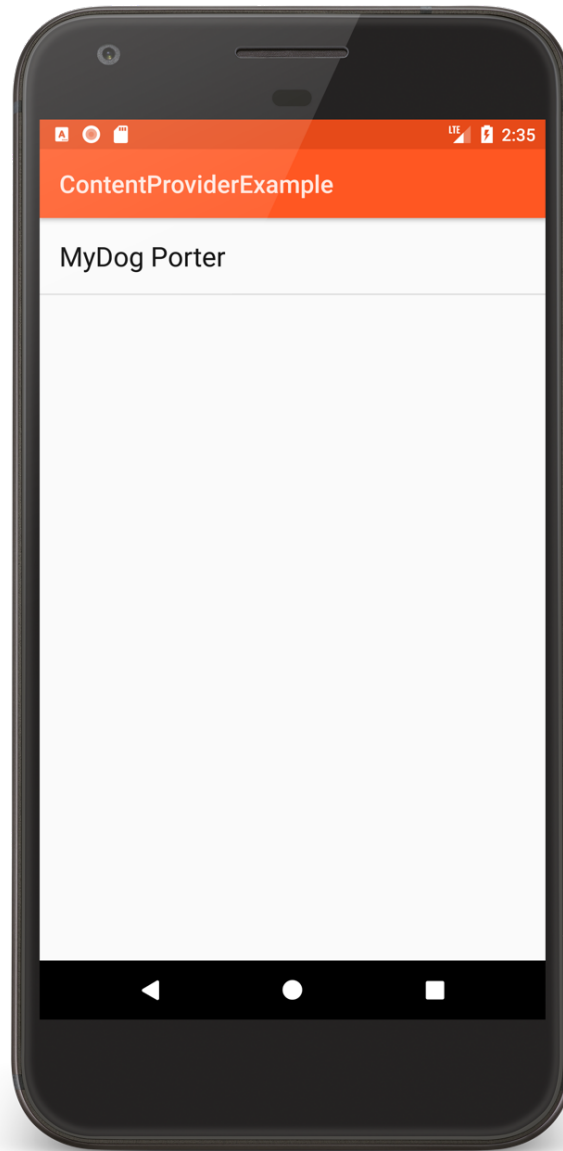
```
Cursor query (  
    Uri uri,                // ContentProvider Uri  
    String[] projection     // Columns to retrieve  
    String selection       // SQL selection pattern  
  
    String[] selectionArgs  // SQL pattern args  
    String sortOrder       // Sort order  
)
```

ContentProviderExample

Extracts Contact information from the Android
Contacts ContentProvider

Displays each contact's name

ContentProvider Example



...

```
public void onCreate(Bundle savedInstanceState) {  
    super.onCreate(savedInstanceState);  
  
    if (checkSelfPermission(Manifest.permission.READ_CONTACTS) !=  
        PackageManager.PERMISSION_GRANTED) {  
        requestPermissions(permissions, mRequestCode);  
    } else {  
        displayContact();  
    }  
}
```

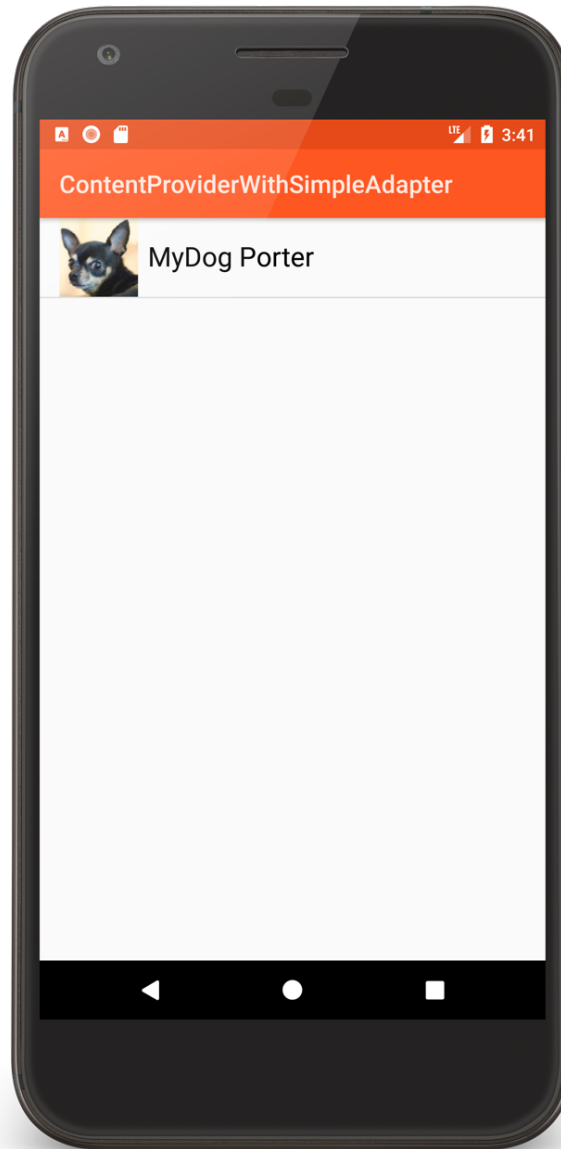
```
private void displayContact() {  
    ContentResolver contentResolver = getContentResolver();  
    Cursor cursor = contentResolver.query(ContactsContract.Contacts.CONTENT_URI,  
        new String[]{ContactsContract.Contacts.DISPLAY_NAME},  
        null, null, null);  
    List<String> contacts = new ArrayList<>();  
    if (null != cursor && cursor.moveToFirst()) {  
        do {  
            contacts.add(cursor.getString(cursor.getColumnIndex(  
                ContactsContract.Contacts.DISPLAY_NAME)));  
        } while (cursor.moveToNext());  
        cursor.close();  
    }  
    ArrayAdapter<String> adapter =  
        new ArrayAdapter<>(this, R.layout.list_item, contacts);  
    setListAdapter(adapter);  
}
```

ContentProviderWithSimpleAdapter

Extracts Contact information from the android
Contacts ContentProvider

Displays each contact's name and photo, if available

ContentProvider WithSimpleAdapter



```
private void loadContacts() {  
    ...  
    // query contacts ContentProvider  
    mCursor = contentResolver.query(Contacts.CONTENT_URI,  
                                    columnsToExtract, whereClause, null, sortOrder);  
  
    // pass cursor to custom list adapter  
    setListAdapter(new ContactInfoListAdapter(this, R.layout.list_item, mCursor, 0));  
}
```

```
public class ContactInfoListAdapter extends ResourceCursorAdapter {  
    ...  
    public ContactInfoListAdapter(Context context, int layout, Cursor c, int flags) {  
        ....  
        // default thumbnail photo  
        mNoPictureBitmap = (BitmapDrawable) context.getResources().getDrawable(  
            R.drawable.ic_contact_picture, context.getTheme());  
        mBitmapSize = (int) context.getResources().getDimension(  
            R.dimen.textview_height);  
        mNoPictureBitmap.setBounds(0, 0, mBitmapSize, mBitmapSize);  
    }  
}
```

// Create and return a new contact data view

```
public View newView(Context context, Cursor cursor, ViewGroup parent) {  
    LayoutInflater inflater = (LayoutInflater) context  
        .getSystemService(Context.LAYOUT_INFLATER_SERVICE);  
    return inflater.inflate(R.layout.list_item, parent, false);  
}
```



```
if (input != null) {  
    photoBitmap = new BitmapDrawable(  
        mContext.getResources(), input);  
    photoBitmap.setBounds(0, 0, mBitmapSize, mBitmapSize);  
}  
} ...  
}
```

// Set thumbnail image

```
textView.setCompoundDrawables(photoBitmap, null, null, null);
```

```
}  
}
```

CursorLoader

Conducting intensive operations on the main thread can affect application responsiveness

CursorLoader uses an `AsyncTask` to perform queries on a background thread

Note: CursorLoader is now deprecated. Future implementations should use `ViewModel`

Using a CursorLoader

Implement LoaderManager's LoaderCallbacks interface

Create and initialize a cursor loader

initLoader()

Initialize and activate a Loader

```
Loader<D> initLoader(  
    int id,  
    Bundle args,  
    LoaderCallbacks<D> callback)
```

LoaderCallbacks

Called to instantiate and return a new Loader for the specified ID

```
Loader<D> onCreateLoader (  
    int id,  
    Bundle args)
```

LoaderCallbacks

Called when a previously created Loader has finished loading

```
void onLoadFinished(  
                    Loader<D> loader,  
                    D data)
```

LoaderCallbacks

Called when a previously created Loader is reset

```
void onLoaderReset (Loader<D> loader)
```

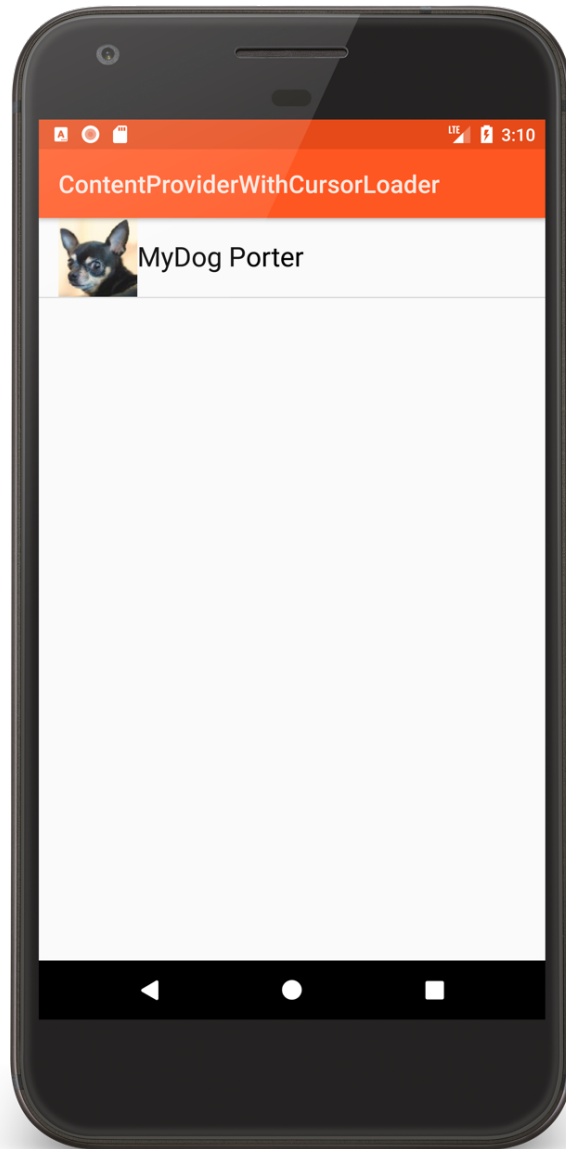
ContentProviderWithCursorLoader

Extracts Contact information from the Android Contacts ContentProvider

Displays each contact's name and photo, if available

Uses a CursorLoader when querying the ContentProvider

ContentProvider
WithCursorLoader



```
public class ContactsListActivity extends ListActivity implements  
    LoaderManager.LoaderCallbacks<Cursor> {
```

```
...
```

```
public void onCreate(Bundle savedInstanceState) {  
    super.onCreate(savedInstanceState);  
  
    if (checkSelfPermission(Manifest.permission.READ_CONTACTS) !=  
        PackageManager.PERMISSION_GRANTED) {  
        requestPermissions(permissions, mRequestCode);  
    } else {  
        loadContacts();  
    }  
}
```

```
private void loadContacts() {  
    // Create and set empty adapter  
    mAdapter = new ContactInfoListAdapter(this, R.layout.list_item, null, 0);  
    setListAdapter(mAdapter);  
    // Initialize the loader  
    getLoaderManager().initLoader(0, null, this);  
}
```

```
// Contacts data items to extract  
private static final String[] CONTACTS_ROWS = new String[]{Contacts._ID,  
    Contacts.DISPLAY_NAME, Contacts.PHOTO_THUMBNAIL_URI};
```

// Called when a new Loader should be created. Returns a new CursorLoader

```
public Loader<Cursor> onCreateLoader(int id, Bundle args) {
```

// String used to filter contacts with empty or missing names or are unstarred

```
String select = "(" + Contacts.DISPLAY_NAME + " NOTNULL) AND ("
    + Contacts.DISPLAY_NAME + " != " ) AND (" + Contacts.STARRED
    + " == 1))";
```

// String used for defining the sort order

```
String sortOrder = Contacts._ID + " ASC";
```

```
return new CursorLoader(this, Contacts.CONTENT_URI, CONTACTS_ROWS,
    select, null, sortOrder);
```

```
}
```

```
// Called when the Loader has finished loading its data  
public void onLoadFinished(Loader<Cursor> loader, Cursor data) {  
    // Swap the new cursor into the List adapter  
    mAdapter.swapCursor(data);  
}
```

```
// Called when the last Cursor provided to onLoadFinished()  
// is about to be closed  
public void onLoaderReset(Loader<Cursor> loader) {  
    // set List adapter's cursor to null  
    mAdapter.swapCursor(null);  
}
```

ContentResolver.delete()

Returns the number of rows deleted

```
int delete (  
    Uri url,                // content Uri  
    String where,          // SQL sel. pattern  
    String[] selectArgs    // SQL pattern args  
)
```

ContentResolver.insert()

Returns the Uri of the inserted row

```
Uri insert (  
    Uri url,                // content Uri  
    ContentValues values    // values  
)
```

ContentResolver.update()

Returns the number of rows updated

```
int update(  
    Uri url,                // content Uri  
    ContentValues values    // new field values  
    String where,          // SQL sel. pattern  
    String[] selectionArgs // SQL pattern args  
)
```


ContentProviderInsertContacts

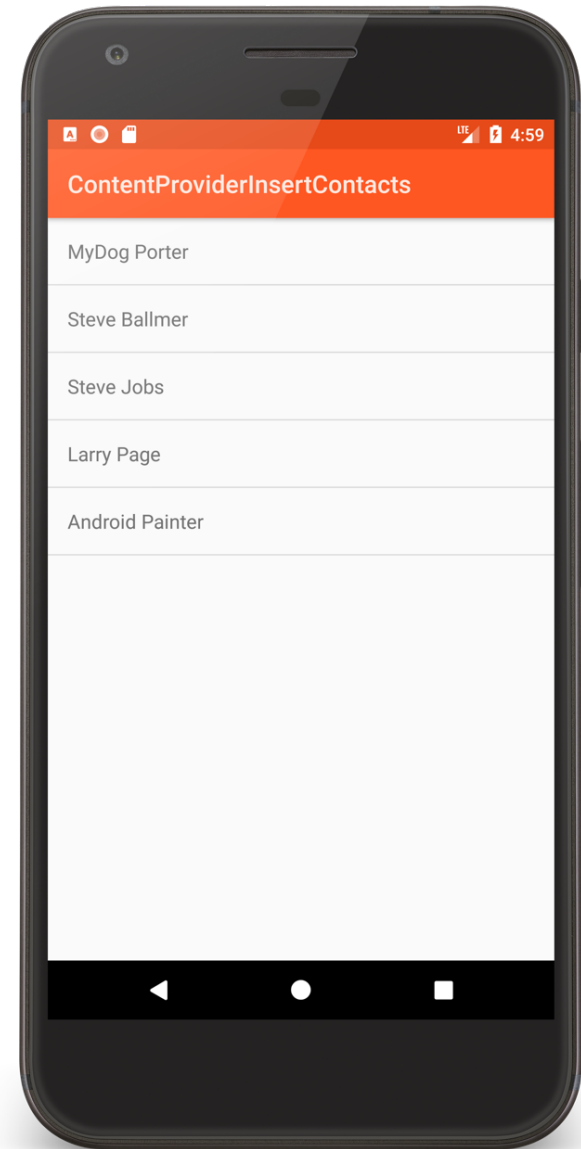
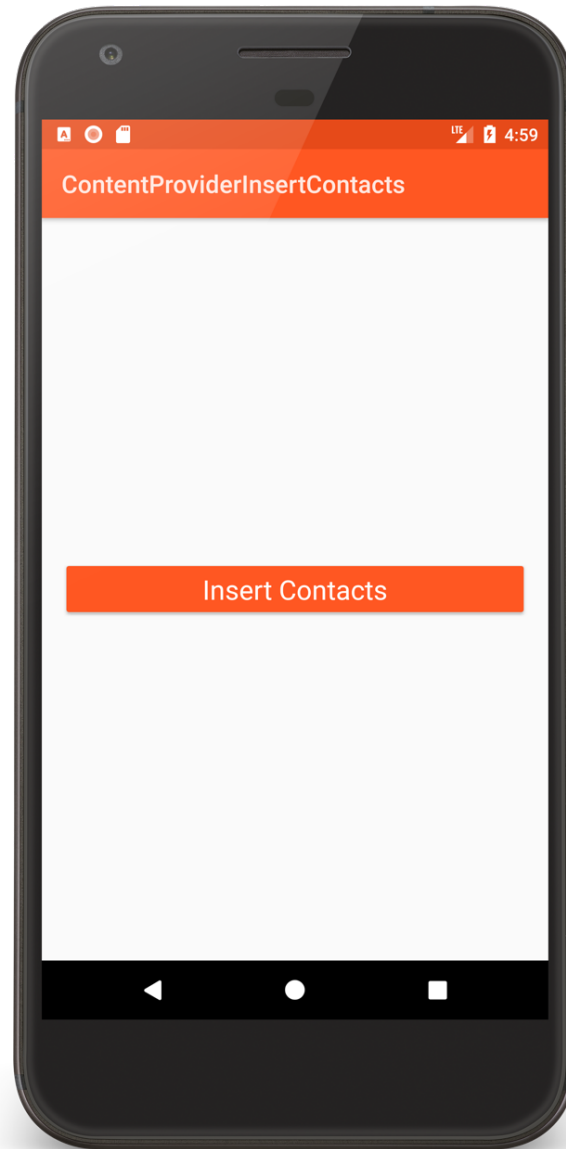
Application reads contact information from the Android Contacts ContentProvider

Inserts several new contacts into Contacts ContentProvider

Displays old and new contacts

Deletes these new contacts on exit

ContentProvider InsertContacts



```
public void onCreate(Bundle savedInstanceState) {  
    ...  
    // Get Account information  
    mAccountList = AccountManager.get(this).getAccountsByType("com.google");  
    // Must have a Google account set up on your device  
    if (mAccountList.length == 0) finish();  
    ...  
    // Insert new contacts  
    insertAllNewContacts();  
    // Create and set empty list adapter  
    mAdapter = new SimpleCursorAdapter(this, R.layout.list_layout, null,  
        columnsToDisplay, resourceIds, 0);  
    setListAdapter(mAdapter);  
  
    // Initialize a CursorLoader  
    getLoaderManager().initLoader(0, null, this);  
}
```

```
// Insert all new contacts into Contacts ContentProvider
private void insertAllNewContacts() {

    // Set up a batch operation on Contacts ContentProvider
    ArrayList<ContentProviderOperation> batchOperation = new
                                                ArrayList<ContentProviderOperation>();

    for (String name : mNames) {
        addRecordToBatchInsertOperation(name, batchOperation);
    }
    try {
        // Apply all batched operations
        getContentResolver().applyBatch(ContactsContract.AUTHORITY, batchOperation);
    }
    ...
}
```

```
// Insert named contact into Contacts ContentProvider
private void addRecordToBatchInsertOperation(String name,
                                             List<ContentProviderOperation> ops) {
    int position = ops.size();
    // First part of operation
    ops.add(ContentProviderOperation.newInsert(RawContacts.CONTENT_URI)
            .withValue(RawContacts.ACCOUNT_TYPE, mName)
            .withValue(RawContacts.ACCOUNT_NAME, mName)
            .withValue(Contacts.STARRED, 1).build());

    // Second part of operation
    ops.add(ContentProviderOperation.newInsert(Data.CONTENT_URI)
            .withValueBackReference(Data.RAW_CONTACT_ID, position)
            .withValue(Data.MIMETYPE, StructuredName.CONTENT_ITEM_TYPE)
            .withValue(StructuredName.DISPLAY_NAME, name).build());
}
```

```
private void deleteAllNewContacts() {  
    for (String name : mNames) {  
        deleteContact(name);  
    }  
}
```

```
private void deleteContact(String name) {  
    getContentResolver().delete(ContactsContract.RawContacts.CONTENT_URI,  
        ContactsContract.Contacts.DISPLAY_NAME + "=?", new String[]{name});  
}
```

Recipe for Creating a ContentProvider

Implement a storage system for the data

Define a Contract Class to support users of your ContentProvider

Implement a ContentProvider subclass

Declare and configure ContentProvider in AndroidManifest.xml

ContentProviderCustom

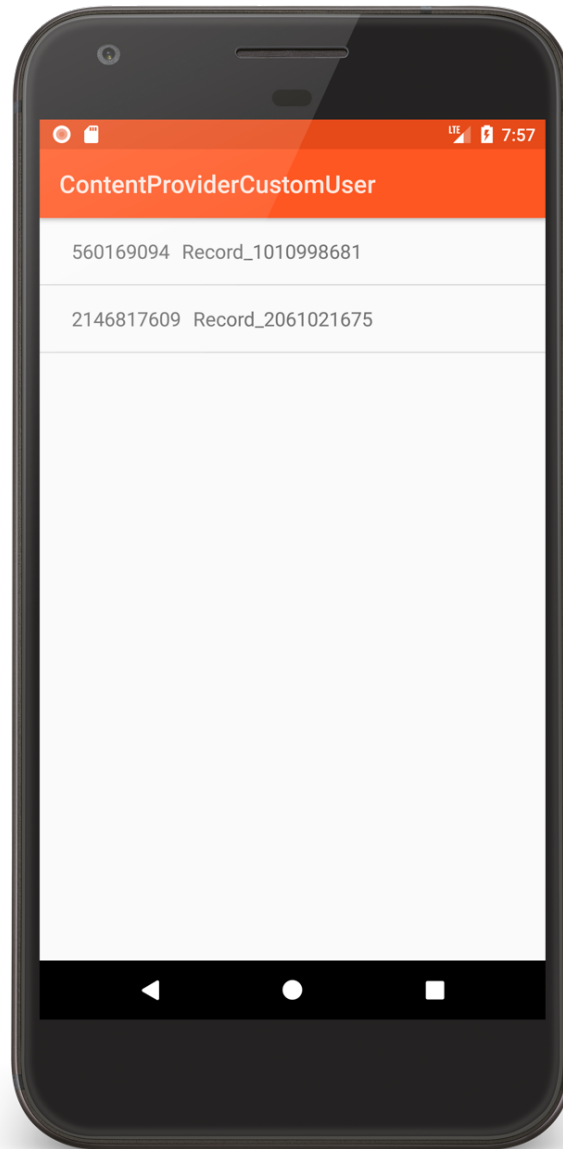
Application defines a ContentProvider for ID/string pairs

ContentProviderCustomUser

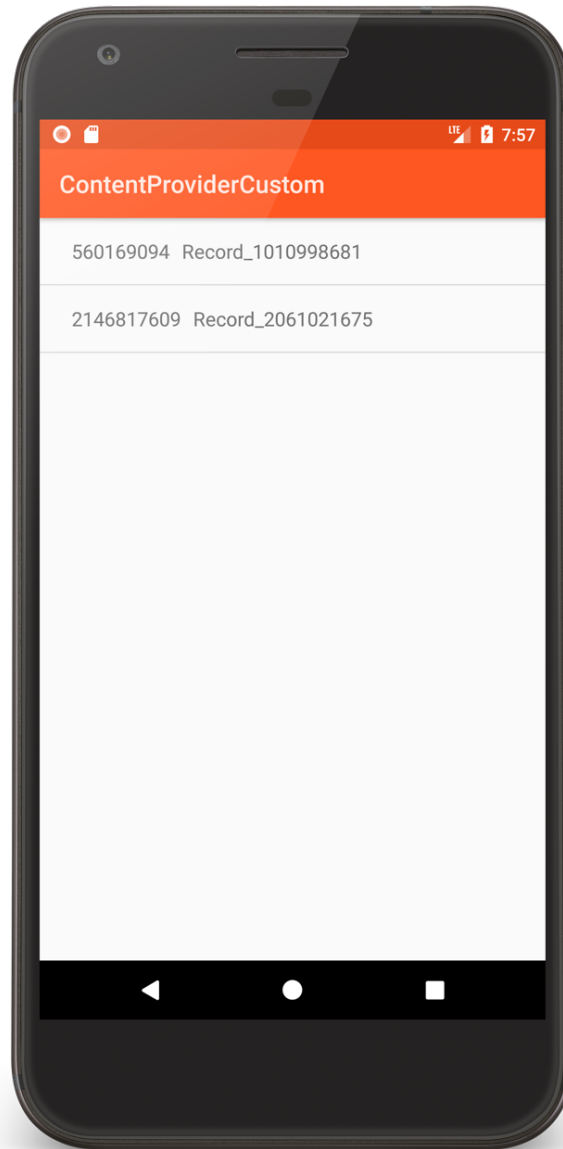
Reads ID/String pairs from the ContentProvider

Inserts and deletes ID/String pairs

ContentProvider
CustomUser



ContentProvider Custom



Example Applications

ContentProviderExample

ContentProviderWithSimpleAdapter

ContentProviderWithCursorLoader

ContentProviderInsertContacts

ContentProviderCustom

ContentProviderCustomUser