CS 683 Emerging Technologies
Fall Semester, 2008
Doc 20 Android Content Provider
Dec 2 2008

References

Google Android Documentation, http://code.google.com/android/documentation.html

Content Provider

Only way to share data across applications

Can

- Retrieve
- Modify
- Create

Android Native Content Providers

Contacts
MediaStore.Audio
MediaStore.Images
MediaStore.Video

See http://code.google.com/android/reference/android/provider/package-summary.html

Basic Idea

Datum mapped to a URI

URI is used to access data by client

content://contacts/people/
    All contact names

content://contacts/people/23
    Contact with _ID = 21

Sample Query

```
myPerson = Uri.parse("content://contacts/people/23");
Cursor cur = managedQuery(myPerson, null, null, null, null);
```

Second way to create URI

```
Uri myPerson = ContentUris.withAppendedId(People.CONTENT_URI, 23);
```

CONTENT_URI

Content URI can be complex

Rather than hardcoding exact URI everywhere

Content Providers expose the base URI as static field

NameProvider.CONTENT_URI

```
public static final String AUTHORITY = "edu.sdsu.cs683.NameProvider";
public static final Uri CONTENT_URI = Uri.parse("content://"
                + AUTHORITY + "/names");
```

managedQuery

```
public final Cursor managedQuery(Uri uri,
                                 String[] projection,
                                 String selection,
                                 String[] selectionArgs,
                                 String sortOrder)
```

projection
    Which columns to return
selection
    SQL Where clause with "WHERE"
selectionArgs
    Arguments for selection
sortOrder
    SQL ORDER BY clause

managedQuery

Cursors & Activity States

Managed Part

Cursors can be

- Active
- Deactivated
  - Consume fewer resources
  - deactivate(), requery()
- Closed

ManagedQuery

Activity will manage changing cursor state

Second Example

```
// An array specifying which columns to return.
string[] projection = new string[] {
    People._ID,
    People.NAME,
    People.NUMBER,
};

// Get the base URI for People table in Contacts content provider.
Uri mContacts = People.CONTENT_URI;

Cursor managedCursor = managedQuery( mContacts,
                    projection, //Which columns to return.
                    null,       // WHERE clause--we won't specify.
                    People.NAME + " ASC"); // Order-by clause.
```


Example from http://code.google.com/android/devel/data/contentproviders.html

Reading Columns

Cursor requires column indexes for access

We don't want to know the column index for each data element

ContentProvider should provide column names as static fields

People.NAME

```
public static final String NAME = "NAME";
```

Use Cursor.getColumnIndex(String columnName)

Example

```
private void getColumnData(Cursor cur){
    if (cur.moveToFirst()) {

        String name;
        String phoneNumber;
        int nameColumn = cur.getColumnIndex(People.NAME);
        int phoneColumn = cur.getColumnIndex(People.NUMBER);

        do {
            // Get the field values
            name = cur.getString(nameColumn);
            phoneNumber = cur.getString(phoneColumn);

           // Do something with the values.
            ...
        } while (cur.moveToNext());
    }
}
```


Example from http://code.google.com/android/devel/data/contentproviders.html

Adding a Record

```
ContentValues values = new ContentValues();

values.put(Contacts.People.NAME, "Roger");
values.put(Contacts.People.STARRED,1);        // 1 = add to favorites

//Add Phone Numbers
Uri uri = getContentResolver().insert(Contacts.People.CONTENT_URI, values);
```

android.content.ContentProvider

Abstract class

Primary Abstract Methods

query(Uri uri, String[] columns, String selection, String[] selectionArgs, String sortOrder)
    returns data to the caller

insert(Uri, ContentValues)
    inserts new data into the content provider

update(Uri uri, ContentValues values, String selection, String[] selectionArgs)
    updates existing data in the content provider

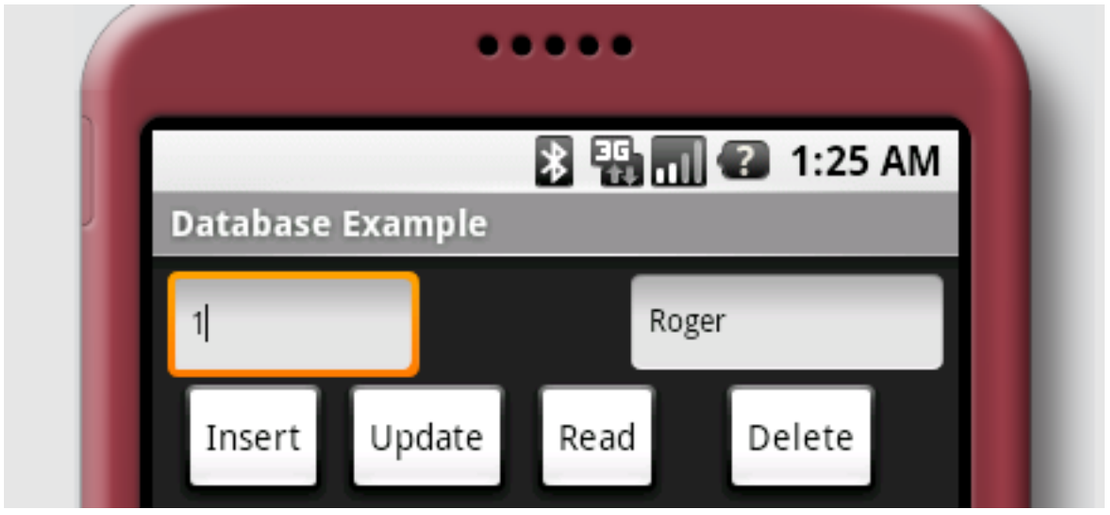
delete(Uri uri, String selection, String[] selectionArgs)
    deletes data from the content provider

getType(Uri)
    returns the MIME type of data in the content provider

Example

Show

- Inserts
- Update
- Delete
- Query
- Same example as last lecture
- Uses ContentProvider



Classes

R.java

Constants, autogenerated

DatabaseHelper.java

Creates tables

Updating of schema

NameProvider.java

ContentProvider

Performs inserts, deletes, updates, queries of data

DatabaseExample.java

Uses NameProvider to access data

URI

content://edu.sdsu.cs683.NameProvider/names

Used to access all name

content://edu.sdsu.cs683.NameProvider/names/12

Access name with ID = 12

edu.sdsu.cs683.NameProvider

Authority

Unique string to identify your data

Suggested to use full class name

MIME Type

vnd.sdsu.cursor.dir/vnd.sdsu.name

MIME type for directory (list) of name

vnd.sdsu.cursor.item/vnd.sdsu.name

MIME type for single name

AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
      package="edu.sdsu.cs683"
      android:versionCode="1"
      android:versionName="1.0.0">
    <application android:icon="@drawable/icon" android:label="@string/app_name">
            <provider android:name="NameProvider"
            android:authorities="edu.sdsu.cs683.NameProvider" />
        <activity android:name=".DatabaseExample"
                android:label="@string/app_name">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
             <intent-filter>
                    <action android:name="android.intent.action.VIEW" />
                <action android:name="android.intent.action.EDIT" />
                <category android:name="android.intent.category.DEFAULT" />
                <data android:mimeType="vnd.sdsu.cursor.item/vnd.sdsu.name" />
            </intent-filter>
        </activity>
    </application>
</manifest>
```

DatabaseHelper.java

```
public class DatabaseHelper extends SQLiteOpenHelper {
    public static final String DATABASE_NAME = "name5.db";
   private static final int DATABASE_VERSION = 1;

   // Column names
    public static final String ID = "_ID";
    public static final String NAME = "NAME";
    public static final String NAMES_TABLE = "NAMES";

   public DatabaseHelper(Context context) {
        super(context, DATABASE_NAME, null, DATABASE_VERSION);
    }
```

DatabaseHelper.java

```
public void onCreate(SQLiteDatabase nameDb) {
      nameDb.execSQL("CREATE TABLE " + NAMES_TABLE + " ("
        + ID + " INTEGER PRIMARY KEY,"
        + NAME + " TEXT"
        + ");");
      nameDb.execSQL("INSERT INTO NAMES ( name) VALUES ('Roger' );");
}

      public void onUpgrade(SQLiteDatabase arg0, int oldVersion, int newVersion) {
      }
}
```

android.content.UriMatcher

Helper class to match URI

UriMatcher(int code)

code = code to match for the root URI (???)

addURI(String authority, String path, int code)

Add a URI to match, and the code to return when this URI is matched.

match(Uri uri)

Try to match against the path in a url.

```
nameUriMatcher = new UriMatcher(UriMatcher.NO_MATCH);
nameUriMatcher.addURI("edu.sdsu.cs683.NameProvider", "names", 1);
nameUriMatcher.addURI("edu.sdsu.cs683.NameProvider", "names/#", 2);
```

```
int match = nameUriMatcher.match(uri);
```

NameProvider.java

```
public class NameProvider extends ContentProvider {
	public static final String AUTHORITY = "edu.sdsu.cs683.NameProvider";
	public static final Uri CONTENT_URI = Uri.parse("content://"
			+ AUTHORITY + "/names");

	// MIME types
	public static final String CONTENT_TYPE = "vnd.sdsu.cursor.dir/vnd.sdsu.name";
	public static final String CONTENT_ITEM_TYPE = "vnd.sdsu.cursor.item/vnd.sdsu.name";

	private DatabaseHelper nameHelper;
	private static final UriMatcher nameUriMatcher;
	private static final int NAMES = 1;
	private static final int NAMES_ID = 2;
	static {
		nameUriMatcher = new UriMatcher(UriMatcher.NO_MATCH);
		nameUriMatcher.addURI(AUTHORITY, "names", NAMES);
		nameUriMatcher.addURI(AUTHORITY, "names/#", NAMES_ID);
	}
```

NameProvider.java

```
public boolean onCreate() {
        nameHelper = (new DatabaseHelper(getContext()));
        return true;
}
```

NameProvider.java

```
public String getType(Uri uri) {
        int match = nameUriMatcher.match(uri);
        switch (match) {
        case NAMES:
                return CONTENT_TYPE;

        case NAMES_ID:
                return CONTENT_ITEM_TYPE;

        default:
                throw new IllegalArgumentException("Unknown URI " + uri);
        }
}
```

NameProvider.java

```
public Uri insert(Uri uri, ContentValues values) {
    if (nameUriMatcher.match(uri) != NAMES) {
        throw new IllegalArgumentException("Unknown URI " + uri);
    }

    SQLiteDatabase db = nameHelper.getWritableDatabase();
    long rowId = db.insert(DatabaseHelper.NAMES_TABLE, DatabaseHelper.NAME,
            values);
    if (rowId > 0) {
        Uri noteUri = ContentUris.withAppendedId(CONTENT_URI, rowId);
        getContext().getContentResolver().notifyChange(noteUri, null);
        return noteUri;
    }

    throw new SQLException("Failed to insert row into " + uri);
}
```

NameProvider.java

```
public Cursor query(Uri uri, String[] projection, String selection,
        String[] selectionArgs, String sortOrder) {

    String sqlSelection = null;
    switch (nameUriMatcher.match(uri)) {
    case NAMES:
        sqlSelection = selection;
        break;

    case NAMES_ID:
        sqlSelection = DatabaseHelper.NAMES_TABLE + "." + DatabaseHelper.ID
                + " = " + uri.getPathSegments().get(1);
        break;

    default:
        throw new IllegalArgumentException("Unknown URI " + uri);
    }
    SQLiteDatabase db = nameHelper.getWritableDatabase();
    Cursor result = db.query(DatabaseHelper.NAMES_TABLE, projection,
            sqlSelection, selectionArgs, null, null, sortOrder);
    result.setNotificationUri(getContext().getContentResolver(), uri);
    return result;
}
```

NameProvider.java

```
public int delete(Uri uri, String where, String[] whereArgs) {
        SQLiteDatabase db = nameHelper.getWritableDatabase();
        int count;
        switch (nameUriMatcher.match(uri)) {
        case NAMES:
                count = db.delete(DatabaseHelper.NAMES_TABLE, where, whereArgs);
                break;

        case NAMES_ID:
                String nameId = uri.getPathSegments().get(1);
                count = db.delete(DatabaseHelper.NAMES_TABLE,
                                DatabaseHelper.ID
                                + " = "
                                + nameId
                                + (!TextUtils.isEmpty(where) ? " AND (" + where
                                                + ')' : ""), whereArgs);
                break;

        default:
                throw new IllegalArgumentException("Unknown URI " + uri);
        }

        getContext().getContentResolver().notifyChange(uri, null);
        return count;
}
```

NameProvider.java

```
public int update(Uri uri, ContentValues values, String where, String[] whereArgs) {
        SQLiteDatabase db = nameHelper.getWritableDatabase();
        int count;
        switch (nameUriMatcher.match(uri)) {
        case NAMES:
                count = db.update(DatabaseHelper.NAMES_TABLE, values, where, whereArgs);
                break;
        case NAMES_ID:
                String nameId = uri.getPathSegments().get(1);
                count = db.update(DatabaseHelper.NAMES_TABLE, values,
                                DatabaseHelper.ID
                                + " = "
                                + nameId
                                + (!TextUtils.isEmpty(where) ? " AND (" + where
                                                + ')' : ""), whereArgs);
                break;
        default:
                throw new IllegalArgumentException("Unknown URI " + uri);
        }
        getContext().getContentResolver().notifyChange(uri, null);
        return count;
}
```

NameProvider.java

```
public Uri insert(Uri uri, ContentValues values) {
        if (nameUriMatcher.match(uri) != NAMES) {
                throw new IllegalArgumentException("Unknown URI " + uri);
        }

        SQLiteDatabase db = nameHelper.getWritableDatabase();
        long rowId = db.insert(DatabaseHelper.NAMES_TABLE, DatabaseHelper.NAME,
                        values);
        if (rowId > 0) {
                Uri noteUri = ContentUris.withAppendedId(CONTENT_URI, rowId);
                getContext().getContentResolver().notifyChange(noteUri, null);
                return noteUri;
        }

        throw new SQLException("Failed to insert row into " + uri);
}
```

DatabaseExample.java

```
public class DatabaseExample extends Activity implements View.OnClickListener {
    private EditText databaseIdText;
    private EditText nameText;
    private DatabaseHelper namesHelper;

    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);
        int[] buttonIds = { R.id.delete, R.id.read, R.id.insert, R.id.update };
        for (int id : buttonIds) {
            Button button = (Button) findViewById(id);
            button.setOnClickListener(this);
        }
        databaseIdText = (EditText) this.findViewById(R.id.databaseId);
        nameText = (EditText) this.findViewById(R.id.name);
        namesHelper = (new DatabaseHelper(this));
        displayDatabaseRecord(1);
    }
```

DatabaseExample.java

```
private String getName() {
	return nameText.getText().toString();
}

private String getId() {
	return databaseIdText.getText().toString();
}

private int getIntId() {
	return Integer.parseInt(getId());
}
```

DatabaseExample.java

```
private void displayDatabaseRecord(int id) {
        Uri firstName = ContentUris.withAppendedId(
                NameProvider.CONTENT_URI, id);

        Cursor result = managedQuery(firstName, null, "select", null, null);
        int rowCount = result.getCount();
        if (rowCount > 0) {
                result.moveToFirst();
                databaseIdText.setText(String.valueOf(result.getInt(0)));
                nameText.setText(result.getString(1));
        } else {
                nameText.setText("none");
        }
}
```

DatabaseExample.java

```
public void onClick(View clicked) {
        switch (clicked.getId()) {
        case R.id.delete:
                Uri nameToDelete = ContentUris.withAppendedId( NameProvider.CONTENT_URI, getIntId());
                int rowsDeleted = getContentResolver().delete(nameToDelete, null, null);
                break;
        case R.id.insert:
                ContentValues newName = new ContentValues(1);
                newName.put(DatabaseHelper.NAME, getName());
                Uri recordUri = getContentResolver().insert(NameProvider.CONTENT_URI, newName);
                break;
        case R.id.read:
                displayDatabaseRecord(getIntId());
                break;
        case R.id.update:
                ContentValues updateName = new ContentValues(1);
                updateName.put(DatabaseHelper.NAME, getName());
                int rowsUpdated = getContentResolver().update(
                                NameProvider.CONTENT_URI, updateName, DatabaseHelper.ID + " = ?",
                                new String[] { getId() });
                break;
        }
}
```