Android SQLite Database Tutorial

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Android provides several ways to store user and app data. SQLite is one way of storing user data. SQLite is a very light weight database which comes with Android OS. In this tutorial I'll be discussing how to write classes to handle all SQLite operations.

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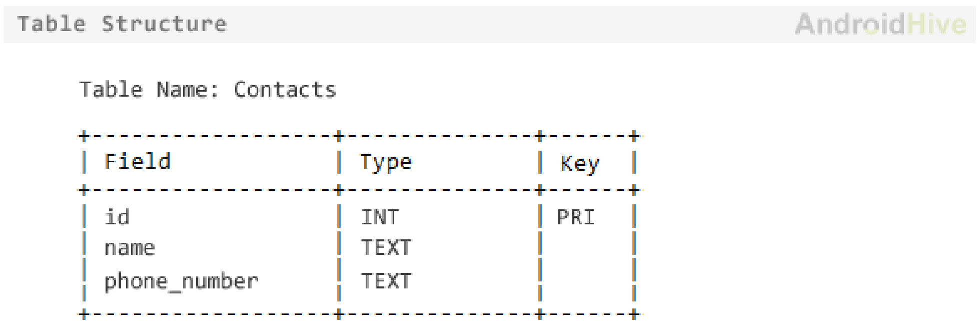
In this tutorial I am taking an example of storing user contacts in SQLite database. I am using a table called Contacts to store user contacts. This table contains three columns **id (INT)**, **name (TEXT)**, **phone_number(TEXT)**.

Contacts Table Structure



```
Table Structure                                      AndroidHive

    Table Name: Contacts

    +-----------------+-------------+------+
    | Field           | Type        | Key  |
    +-----------------+-------------+------+
    | id              | INT         | PRI  |
    | name            | TEXT        |      |
    | phone_number    | TEXT        |      |
    +-----------------+-------------+------+
```

Writing Contact Class

Before you go further you need to write your Contact class with all getter and setter methods to maintain single contact as an object.

```
package com.androidhive.androidsqlite;

public class Contact {

	//private variables
	int _id;
	String _name;
	String _phone_number;

	// Empty constructor
	public Contact(){

	}
	// constructor
	public Contact(int id, String name, String _phone_number){
		this._id = id;
		this._name = name;
		this._phone_number = _phone_number;
	}

	// constructor
	public Contact(String name, String _phone_number){
		this._name = name;
		this._phone_number = _phone_number;
	}
	// getting ID
	public int getID(){
		return this._id;
	}

	// setting id
	public void setID(int id){
		this._id = id;
	}

	// getting name
	public String getName(){
		return this._name;
	}

	// setting name
	public void setName(String name){
		this._name = name;
	}

	// getting phone number
	public String getPhoneNumber(){
		return this._phone_number;
	}

	// setting phone number
	public void setPhoneNumber(String phone_number){
		this._phone_number = phone_number;
	}
}
```

Writing SQLite Database Handler Class

We need to write our own class to handle all database CRUD(Create, Read, Update and Delete) operations.

1. Create a new project by going to **File ⇒ New Android Project**.
2. Once the project is created, create a new class in your project src directory and name it as *DatabaseHandler.java* (**Right Click on src/package ⇒ New ⇒ Class**)
3. Now extend your DatabaseHandler.java class from **SQLiteOpenHelper**.

```
public class DatabaseHandler extends SQLiteOpenHelper {
```

4. After extending your class from SQLiteOpenHelper you need to override two methods **onCreate()** and **onUpgrage()**
onCreate() – These is where we need to write create table statements. This is called when database is created.
onUpgrade() – This method is called when database is upgraded like modifying the table structure, adding constraints to database etc.,

```
public class DatabaseHandler extends SQLiteOpenHelper {

        // All Static variables
        // Database Version
        private static final int DATABASE_VERSION = 1;

        // Database Name
        private static final String DATABASE_NAME = "contactsManager";

        // Contacts table name
        private static final String TABLE_CONTACTS = "contacts";

        // Contacts Table Columns names
        private static final String KEY_ID = "id";
        private static final String KEY_NAME = "name";
        private static final String KEY_PH_NO = "phone_number";

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

        // Creating Tables
        @Override
        public void onCreate(SQLiteDatabase db) {
                String CREATE_CONTACTS_TABLE = "CREATE TABLE " + TABLE_CONTACTS + "("
                                + KEY_ID + " INTEGER PRIMARY KEY," + KEY_NAME + " TEXT,"
                                + KEY_PH_NO + " TEXT" + ")";
                db.execSQL(CREATE_CONTACTS_TABLE);
        }

        // Upgrading database
        @Override
        public void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {
                // Drop older table if existed
                db.execSQL("DROP TABLE IF EXISTS " + TABLE_CONTACTS);

                // Create tables again
                onCreate(db);
        }
```

⇒All CRUD Operations (Create, Read, Update and Delete)

Now we need to write methods for handling all database read and write operations. Here we are implementing following methods for our contacts table.

```
// Adding new contact
public void addContact(Contact contact) {}

// Getting single contact
public Contact getContact(int id) {}

// Getting All Contacts
public List<Contact> getAllContacts() {}

// Getting contacts Count
public int getContactsCount() {}
// Updating single contact
public int updateContact(Contact contact) {}

// Deleting single contact
public void deleteContact(Contact contact) {}
```

⇒Inserting new Record

The *addContact()* method accepts Contact object as parameter. We need to build ContentValues parameters using Contact object. Once we inserted data in database we need to close the database connection.

```
        // Adding new contact
        public void addContact(Contact contact) {
                SQLiteDatabase db = this.getWritableDatabase();

                ContentValues values = new ContentValues();
                values.put(KEY_NAME, contact.getName()); // Contact Name
                values.put(KEY_PH_NO, contact.getPhoneNumber()); // Contact Phone Number

                // Inserting Row
                db.insert(TABLE_CONTACTS, null, values);
        db.close(); // Closing database connection
    }
```

⇒Reading Row(s)

The following method *getContact()* will read single contact row. It accepts id as parameter and will return the matched row from the database.

```
    // Getting single contact
    public Contact getContact(int id) {
        SQLiteDatabase db = this.getReadableDatabase();

        Cursor cursor = db.query(TABLE_CONTACTS, new String[] { KEY_ID,
                KEY_NAME, KEY_PH_NO }, KEY_ID + "=?",
                new String[] { String.valueOf(id) }, null, null, null, null);
        if (cursor != null)
            cursor.moveToFirst();

        Contact contact = new Contact(Integer.parseInt(cursor.getString(0)),
                cursor.getString(1), cursor.getString(2));
        // return contact
        return contact;
    }
```

getAllContacts() will return all contacts from database in array list format of Contact class type. You need to write a for loop to go through each contact.

```
    // Getting All Contacts
     public List<Contact> getAllContacts() {
        List<Contact> contactList = new ArrayList<Contact>();
        // Select All Query
        String selectQuery = "SELECT  * FROM " + TABLE_CONTACTS;

        SQLiteDatabase db = this.getWritableDatabase();
        Cursor cursor = db.rawQuery(selectQuery, null);

        // looping through all rows and adding to list
        if (cursor.moveToFirst()) {
            do {
                Contact contact = new Contact();
                contact.setID(Integer.parseInt(cursor.getString(0)));
                contact.setName(cursor.getString(1));
                contact.setPhoneNumber(cursor.getString(2));
                // Adding contact to list
                contactList.add(contact);
            } while (cursor.moveToNext());
        }

        // return contact list
        return contactList;
    }
```

getContactsCount() will return total number of contacts in SQLite database.

```
// Getting contacts Count
    public int getContactsCount() {
        String countQuery = "SELECT  * FROM " + TABLE_CONTACTS;
        SQLiteDatabase db = this.getReadableDatabase();
        Cursor cursor = db.rawQuery(countQuery, null);
        cursor.close();

        // return count
        return cursor.getCount();
    }
```

⇒Updating Record

updateContact() will update single contact in database. This method accepts Contact class object as parameter.

```
    // Updating single contact
    public int updateContact(Contact contact) {
        SQLiteDatabase db = this.getWritableDatabase();

        ContentValues values = new ContentValues();
        values.put(KEY_NAME, contact.getName());
        values.put(KEY_PH_NO, contact.getPhoneNumber());
```

```
		// updating row
		return db.update(TABLE_CONTACTS, values, KEY_ID + " = ?",
				new String[] { String.valueOf(contact.getID()) });
	}
```

⇒Deleting Record

deleteContact() will delete single contact from database.

```
	// Deleting single contact
	public void deleteContact(Contact contact) {
		SQLiteDatabase db = this.getWritableDatabase();
		db.delete(TABLE_CONTACTS, KEY_ID + " = ?",
				new String[] { String.valueOf(contact.getID()) });
		db.close();
	}
```

Complete DatabaseHandler.java Code:

```
package com.androidhive.androidsqlite;

import java.util.ArrayList;
import java.util.List;

import android.content.ContentValues;
import android.content.Context;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteOpenHelper;

public class DatabaseHandler extends SQLiteOpenHelper {

	// All Static variables
	// Database Version
	private static final int DATABASE_VERSION = 1;

	// Database Name
	private static final String DATABASE_NAME = "contactsManager";

	// Contacts table name
	private static final String TABLE_CONTACTS = "contacts";

	// Contacts Table Columns names
	private static final String KEY_ID = "id";
	private static final String KEY_NAME = "name";
	private static final String KEY_PH_NO = "phone_number";

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

	// Creating Tables
	@Override
	public void onCreate(SQLiteDatabase db) {
		String CREATE_CONTACTS_TABLE = "CREATE TABLE " + TABLE_CONTACTS + "("
				+ KEY_ID + " INTEGER PRIMARY KEY," + KEY_NAME + " TEXT,"
				+ KEY_PH_NO + " TEXT" + ")";
		db.execSQL(CREATE_CONTACTS_TABLE);
	}

	// Upgrading database
	@Override
	public void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {
		// Drop older table if existed
		db.execSQL("DROP TABLE IF EXISTS " + TABLE_CONTACTS);

		// Create tables again
		onCreate(db);
	}

	/**
	 * All CRUD(Create, Read, Update, Delete) Operations
	 */

	// Adding new contact
	void addContact(Contact contact) {
		SQLiteDatabase db = this.getWritableDatabase();
```

```
        ContentValues values = new ContentValues();
        values.put(KEY_NAME, contact.getName()); // Contact Name
        values.put(KEY_PH_NO, contact.getPhoneNumber()); // Contact Phone

        // Inserting Row
        db.insert(TABLE_CONTACTS, null, values);
        db.close(); // Closing database connection
}

// Getting single contact
Contact getContact(int id) {
        SQLiteDatabase db = this.getReadableDatabase();

        Cursor cursor = db.query(TABLE_CONTACTS, new String[] { KEY_ID,
                        KEY_NAME, KEY_PH_NO }, KEY_ID + "=?",
                        new String[] { String.valueOf(id) }, null, null, null, null);
        if (cursor != null)
                cursor.moveToFirst();

        Contact contact = new Contact(Integer.parseInt(cursor.getString(0)),
                        cursor.getString(1), cursor.getString(2));
        // return contact
        return contact;
}

// Getting All Contacts
public List<Contact> getAllContacts() {
        List<Contact> contactList = new ArrayList<Contact>();
        // Select All Query
        String selectQuery = "SELECT  * FROM " + TABLE_CONTACTS;

        SQLiteDatabase db = this.getWritableDatabase();
        Cursor cursor = db.rawQuery(selectQuery, null);

        // looping through all rows and adding to list
        if (cursor.moveToFirst()) {
                do {
                        Contact contact = new Contact();
                        contact.setID(Integer.parseInt(cursor.getString(0)));
                        contact.setName(cursor.getString(1));
                        contact.setPhoneNumber(cursor.getString(2));
                        // Adding contact to list
                        contactList.add(contact);
                } while (cursor.moveToNext());
        }

        // return contact list
        return contactList;
}

// Updating single contact
public int updateContact(Contact contact) {
        SQLiteDatabase db = this.getWritableDatabase();

        ContentValues values = new ContentValues();
        values.put(KEY_NAME, contact.getName());
        values.put(KEY_PH_NO, contact.getPhoneNumber());

        // updating row
        return db.update(TABLE_CONTACTS, values, KEY_ID + " = ?",
                        new String[] { String.valueOf(contact.getID()) });
}

// Deleting single contact
public void deleteContact(Contact contact) {
        SQLiteDatabase db = this.getWritableDatabase();
        db.delete(TABLE_CONTACTS, KEY_ID + " = ?",
                        new String[] { String.valueOf(contact.getID()) });
        db.close();
}


// Getting contacts Count
public int getContactsCount() {
        String countQuery = "SELECT  * FROM " + TABLE_CONTACTS;
        SQLiteDatabase db = this.getReadableDatabase();
        Cursor cursor = db.rawQuery(countQuery, null);
        cursor.close();

        // return count
        return cursor.getCount();
}
```

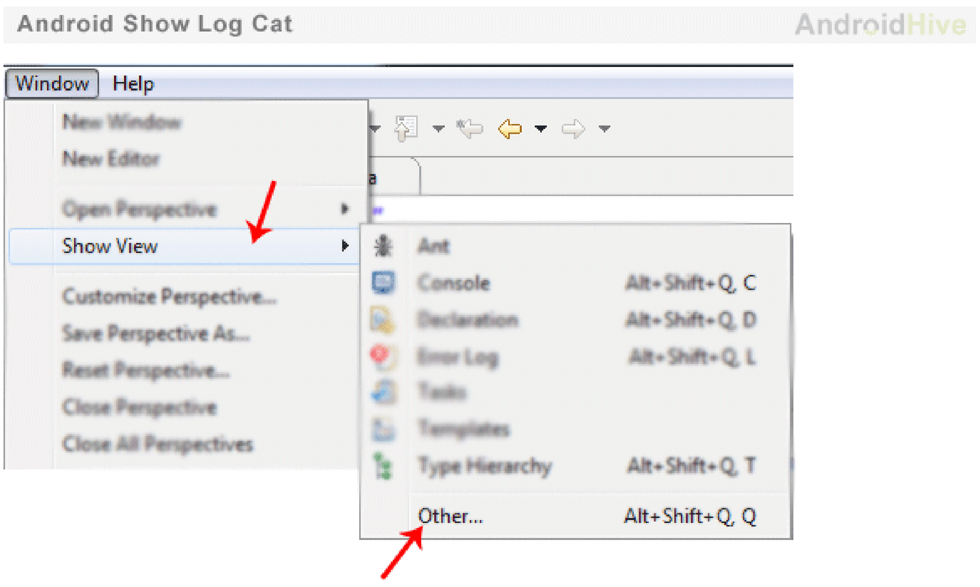
```
}
```

Usage:

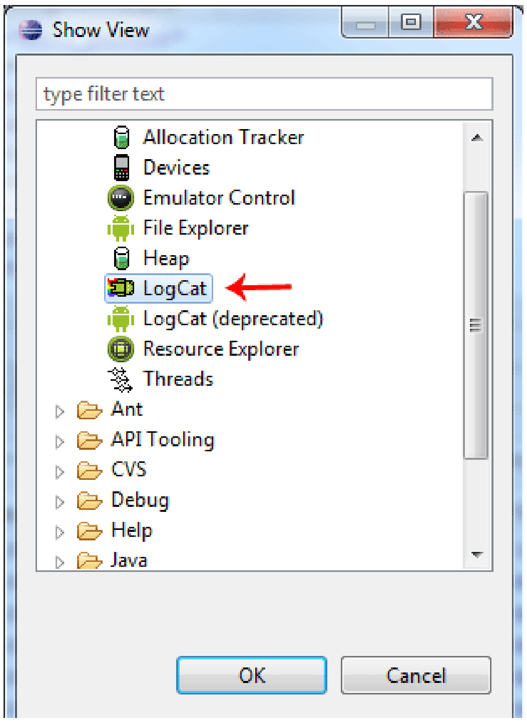
```
package com.androidhive.androidsqlite;

import java.util.List;

import android.app.Activity;
import android.os.Bundle;
import android.util.Log;
import android.widget.TextView;

public class AndroidSQLiteTutorialActivity extends Activity {
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        DatabaseHandler db = new DatabaseHandler(this);

        /**
         * CRUD Operations
         * */
        // Inserting Contacts
        Log.d("Insert: ", "Inserting ..");
        db.addContact(new Contact("Ravi", "9100000000"));
        db.addContact(new Contact("Srinivas", "9199999999"));
        db.addContact(new Contact("Tommy", "9522222222"));
        db.addContact(new Contact("Karthik", "9533333333"));

        // Reading all contacts
        Log.d("Reading: ", "Reading all contacts..");
        List<Contact> contacts = db.getAllContacts();

        for (Contact cn : contacts) {
                String log = "Id: "+cn.getID()+" ,Name: " + cn.getName() + " ,Phone: " + cn.getPhoneNumber();
                // Writing Contacts to log
                Log.d("Name: ", log);
        }
    }
}
```

Android Log Cat Report:

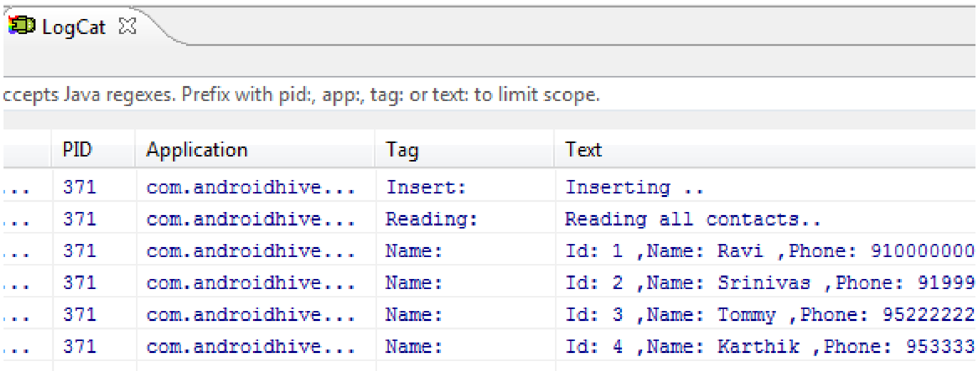
I am writing output to Log report. You can see your log report by going to **Windows ⇒ Show View ⇒ Other.. ⇒ Android ⇒ Log Cat.**



SQLite Output Log AndroidHive



SQLite Output Log AndroidHive


LogCat
ccepts Java regexes. Prefix with pid:, app:, tag: or text: to limit scope.

```
    PID   Application           Tag        Text
... 371   com.androidhive...    Insert:    Inserting ..
... 371   com.androidhive...    Reading:   Reading all contacts..
... 371   com.androidhive...    Name:      Id: 1 ,Name: Ravi ,Phone: 910000000
... 371   com.androidhive...    Name:      Id: 2 ,Name: Srinivas ,Phone: 91999
... 371   com.androidhive...    Name:      Id: 3 ,Name: Tommy ,Phone: 95222222
... 371   com.androidhive...    Name:      Id: 4 ,Name: Karthik ,Phone: 953333
```

What’s Next?

If you feel comfortable with SQLite database, check out Android SQLite Database with Multiple Tables which explains how to handle SQLite when your app needs more than one table.

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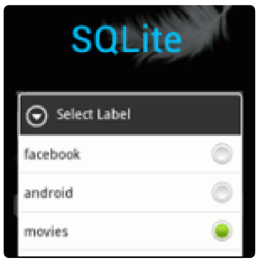

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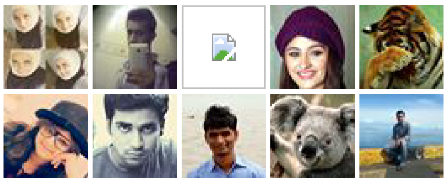

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