

MODULE 11

DATABASE

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Android Database

- ▶ Android stores database in private disk space associated to the application (internal storage)
 - Data is secure
 - By default this area is not accessible to other applications
- ▶ SQLite

Creating Database Using a SQL Helper

- ▶ SQLiteOpenHelper class
 - Use this class to obtain references to database
 - The system performs the potentially long-running operations of creating and updating the database
 - Only when needed
 - Not during app startup

Creating Database Using a SQL Helper

- ▶ Create a subclass of **SQLiteOpenHelper**
 - Override the `onCreate()`, `onUpgrade()` and `onOpen()` methods
 - Call `getWritableDatabase()` or `getReadableDatabase()` methods
 - **Note:** Because they can be long-running, call `getWritableDatabase()` or `getReadableDatabase()` in a background thread, such as with `AsyncTask` or `IntentService`

Creating Database Using a SQL Helper

► E.g,

```
import android.content.Context;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteOpenHelper;

public class BookDBHelper extends SQLiteOpenHelper {
    private static final String SQL_CREATE_ENTRIES =
        "create table book (bookid integer primary key autoincrement, title text, price real)";
    private static final String SQL_DELETE_ENTRIES =
        "drop table if exists book";
    public static final int DATABASE_VERSION = 1;
    public static final String DATABASE_NAME = "BookDB.db";

    public BookDBHelper(Context context) {
        super(context, DATABASE_NAME, null, DATABASE_VERSION);
    }
    public void onCreate(SQLiteDatabase db) {
        db.execSQL(SQL_CREATE_ENTRIES);
    }
    public void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {
        db.execSQL(SQL_DELETE_ENTRIES);
        onCreate(db);
    }
}
```

Datatypes In SQLite

▶ NULL

- The value is a NULL value

▶ INTEGER

- The value is a signed integer, stored in 1, 2, 3, 4, 6, or 8 bytes depending on the magnitude of the value

▶ REAL

- The value is a floating point value, stored as an 8-byte IEEE floating point number

▶ TEXT

- The value is a text string, stored using the database encoding (UTF-8, UTF-16BE or UTF-16LE)

▶ BLOB

- The value is a blob of data, stored exactly as it was input

Datatypes In SQLite

▶ No Boolean Datatype

- Boolean values are stored as integers 0 (false) and 1 (true)

▶ No Date and Time Datatype

- Built-in Date And Time Functions of SQLite are capable of storing dates and times as TEXT, REAL, or INTEGER values:
 - **TEXT** as ISO8601 strings ("YYYY-MM-DD HH:MM:SS.SSS")
 - **REAL** as Julian day numbers, the number of days since noon in Greenwich on November 24, 4714 B.C. according to the proleptic Gregorian calendar
 - **INTEGER** as Unix Time, the number of seconds since 1970-01-01 00:00:00 UTC

Inserting Data into Database

- ▶ To access database, instantiate subclass of SQLiteOpenHelper
- ▶ Get the data repository (**SQLiteDatabase** object) in write mode
 - Call **getWritableDatabase()**
- ▶ Create a new map of values, where column names are the keys
 - Using **ContentValues** object
- ▶ Then insert row
 - Call **insert** method on SQLiteDatabase object using ContentValues object

Inserting Data into Database

► E.g,

```
import model.Book;
import android.content.ContentValues;
import android.content.Context;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;
```

```
public class BookDAO {
```

```
    private Context context;
    private BookDBHelper bookHelper;
    private SQLiteDatabase db;
```

```
    public BookDAO (Context context)
    {
        this.context = context;
    }
```

```
    public void addBook(Book book)
    {
```

```
        bookHelper = new BookDBHelper(context);
        db = bookHelper.getWritableDatabase();
```

Get the data repository in write mode

```
        ContentValues values = new ContentValues();
        values.put("title", book.getTitle());
        values.put("price", book.getPrice());
```

```
        db.insert("book", null, values);
```

Insert row into database

```
        db.close();
        bookHelper.close();
    }
```

Table name

Reading Data from Database

- ▶ Get the data repository (**SQLiteDatabase** object) in read mode
 - Call **getReadableDatabase()**
- ▶ Use the **query()** method on SQLiteDatabase object
 - Arguments
 - tableName : the table to query
 - projection: the columns to return
 - selection : the columns for the WHERE clause
 - selectionArgs : the values for the WHERE clause
 - group : the columns to group
 - filter: the filter for row groups
 - sortOrder : the columns to sort on
 - Result
 - A **Cursor** object

Reading Data from Database

- ▶ Then loop on the cursor to read rows
 - Use Cursor methods
 - **getCount()**
 - **moveToFirst()**
 - **moveToNext()**
 - **isAfterLast()**
- ▶ Access current row data using
 - Gettor according of type of row
 - E.g, **getInt**, **getString**, ...

Reading Data from Database

- E.g, selecting a book based on its ID

```
public Book getBookById(Integer id)
{
    bookHelper = new BookDBHelper(context);
    db = bookHelper.getReadableDatabase(); // Get the data repository in read mode
    Book book = null;

    String[] projection = {"bookid" , "title" , "price"}; // The columns to return
    String selection = "bookid = ?"; // The columns for the WHERE clause
    String[] selectionArgs = { String.valueOf(id) }; // The values for the WHERE clause
    String sortOrder = "title"; // The sort order

    Cursor cursor = db.query("book", projection, selection, selectionArgs, null, null, sortOrder);

    if (cursor.getCount() != 0)
    {
        cursor.moveToFirst();
        book = new Book();
        book.set_id(cursor.getInt(cursor.getColumnIndex("bookid")));
        book.setTitle(cursor.getString(cursor.getColumnIndex("title")));
        book.setPrice(cursor.getDouble(cursor.getColumnIndex("price")));
    }

    db.close();
    bookHelper.close();
    return book;
}
```

Reading Data from Database

- E.g, accessing all books

```
public ArrayList<Book> getAllBooks()
{
    bookHelper = new BookDBHelper(context);
    db = bookHelper.getReadableDatabase();
    ArrayList<Book> allBooks = new ArrayList<>();
    Book book;

    String[] projection = {"bookid" , "title" , "price"}; // The columns to return

    Cursor cursor = db.query("book", projection, null, null, null, null, null);

    if (cursor.getCount() != 0)
    {
        cursor.moveToFirst();
        while (!cursor.isAfterLast())
        {
            book = new Book();
            book.set_id(cursor.getInt(cursor.getColumnIndex("bookid")));
            book.setTitle(cursor.getString(cursor.getColumnIndex("title")));
            book.setPrice(cursor.getDouble(cursor.getColumnIndex("price")));
            allBooks.add(book);
            cursor.moveToNext();
        }
    }
    db.close();
    bookHelper.close();
    return allBooks;
}
```


Webography

- ▶ <http://developer.android.com/training/basics/data-storage/databases.html>
- ▶ <http://developer.android.com/guide/topics/ui/layout/listview.html>