Android Development
Data storage Techniques

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Android Files

Persistence is a strategy that allows the reusing of volatile objects and other data items by storing them Into a permanent storage system such as disk files and databases.

File IO management in Android includes –among others- the familiar IO Java classes: Streams, Scanner, PrintWriter, and so on.

Permanent files can be stored *internally* in the device's main memory (usually small, but not volatile) or *externally* in the much larger SD card.

Files stored in the device's memory, share space with other application's resources such as code, icons, pictures, music, etc.

Internal files are called: **Resource Files** or **Embedded Files.**

Choosing a Persistent Environment

Your permanent data storage destination is usually determined by parameters such as:

- size (small/large),
- location (internal/external),
- accessibility (private/public).

Depending of your situation the following options are available:

1.Shared Preferences Store private primitive data in *key-value* pairs.
2.Internal Storage Store private data on the device's main memory.
3.External Storage Store public data on the shared external storage.
4.SQLite Databases 5. Store structured data in a private/public database.
Network Connection Store data on the web.

Preferences

- **Preferences** is an Android lightweight mechanism to store and retrieve *key-value* pairs of primitive data types (also called *Maps*, and *Associative Arrays.*
- Typically used to keep state information and shared data among several activities of an application.
- On each entry <*key-value*> the key is a string and the value must be a primitive data type.
- Preferences are similar to Bundles however they are persistent while Bundles are not.

Preferences

- **Using Preferences API calls**
- You have three API choices to pick a Preference:

1. **getPreferences()** from within your Activity, to access activity specific preferences
2. **getSharedPreferences()** from within your Activity to access application-level preferences
3. **getDefaultSharedPreferences()**, on *PreferencesManager*, to get the shared preferences that work in concert with Android's overall preference framework

Shared Preferences

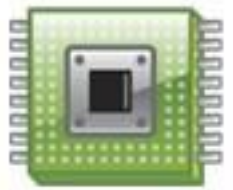
SharedPreferences files are good for handling a handful of Items. Data in this type of container is saved as <**Key, Value**> pairs where the *key* is a string and its associated *value* must be a primitive data type.

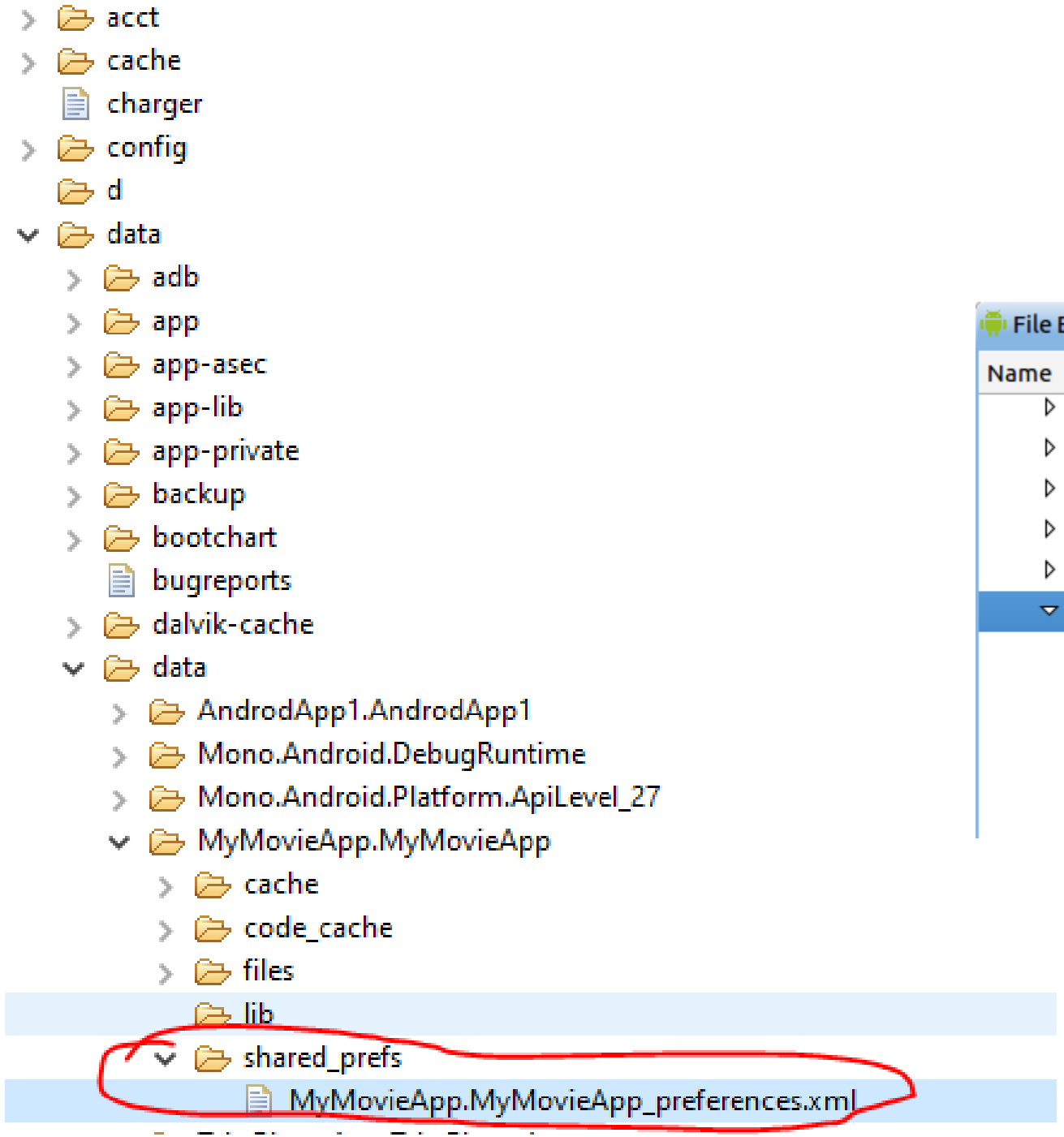
KEY	VALUE

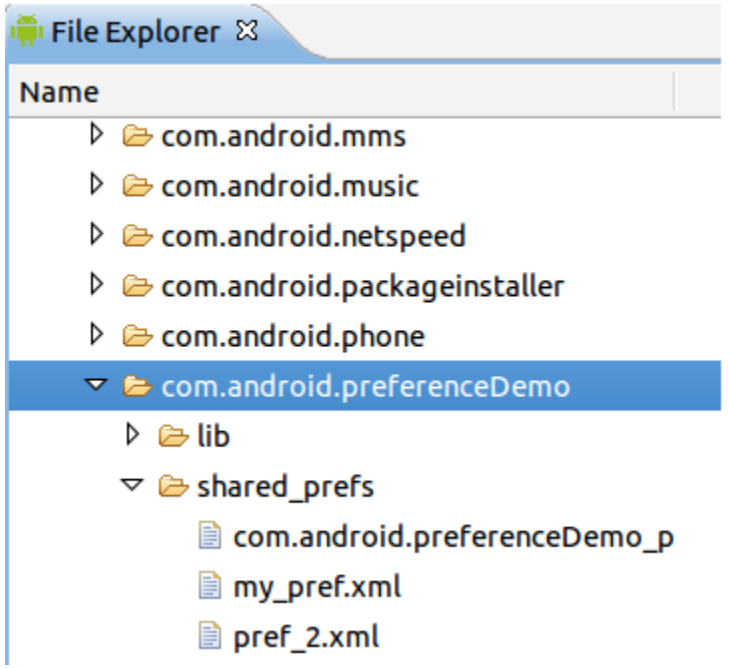
This class is functionally similar to Java Maps, however; unlike [illegible] *permanent*.

Data is stored in the device's internal main memory.

PREFERENCES are typically used to keep state information and sha among several activities of an application.




acct
cache
charger
config
d
data
adb
app
app-asec
app-lib
app-private
backup
bootchart
bugreports
dalvik-cache
data
AndrodApp1.AndrodApp1
Mono.Android.DebugRuntime
Mono.Android.Platform.ApiLevel_27
MyMovieApp.MyMovieApp
cache
code_cache
files
lib
shared_prefs
MyMovieApp.MyMovieApp_preferences.xml

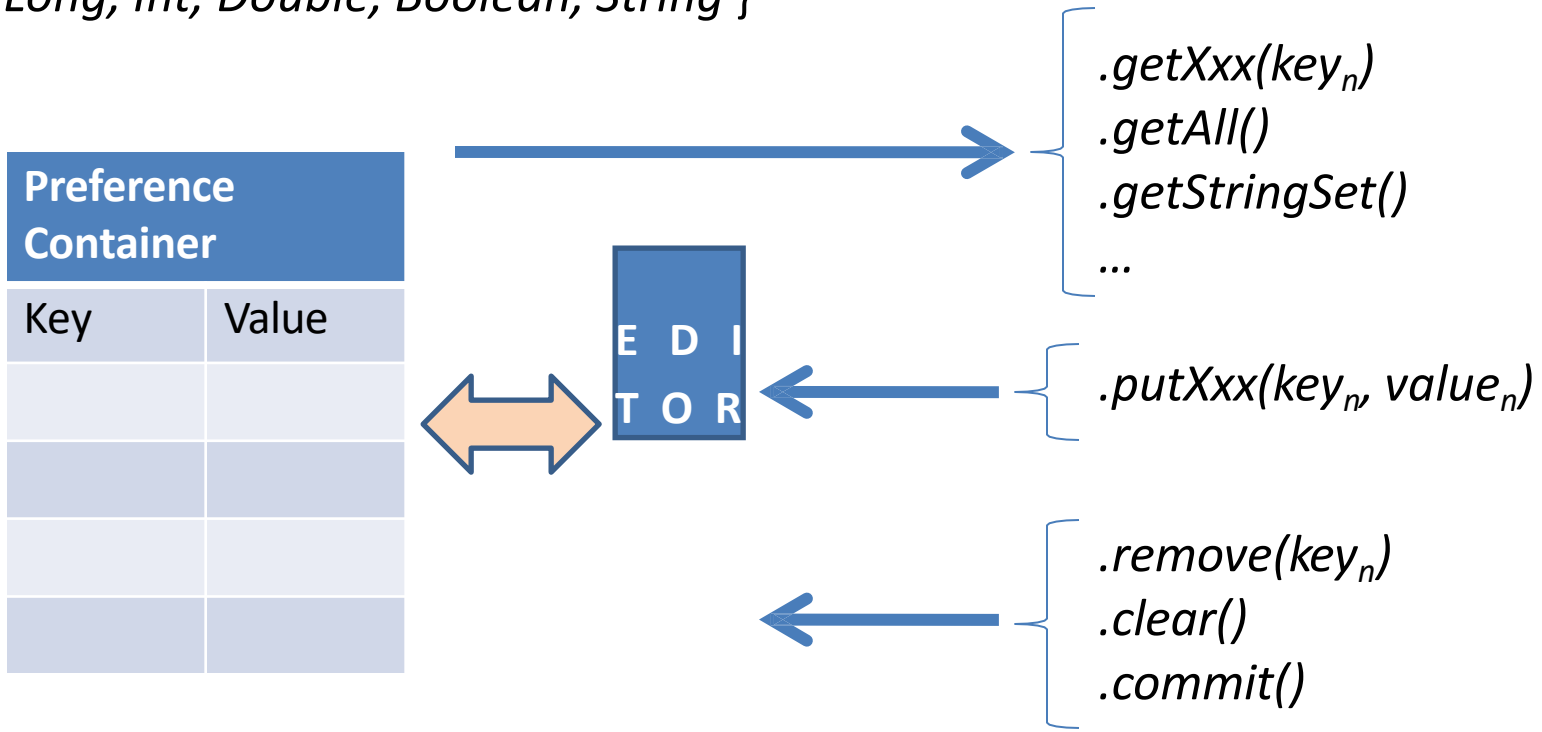

File Explorer
Name
com.android.mms
com.android.music
com.android.netspeed
com.android.packageinstaller
com.android.phone
com.android.preferenceDemo
lib
shared_prefs
com.android.preferenceDemo_p
my_pref.xml
pref_2.xml

Files & Preferences

Using Preferences API calls

Each of the Preference mutator methods carries a typed-value content that can be manipulated by an *editor* that allows *putXxx… and getXxx…* commands to place data in and out of the Preference container.

Xxx = { *Long, Int, Double, Boolean, String* }



Preferences

- **Example**

1. In this example a persistent *SharedPreferences* object is created at the end of an activity lifecycle. It contains data (name, phone, credit, etc. of a fictional customer)
2. The process is interrupted using the "*Back Button*" and re-executed later.
3. Just before been killed, the state of the running application is saved in the designated *Preference* object.
4. When re-executed, it finds the saved *Preference* and uses its persistent data.

Preferences

- **Example2:** Saving/Retrieving a SharedPreference Object

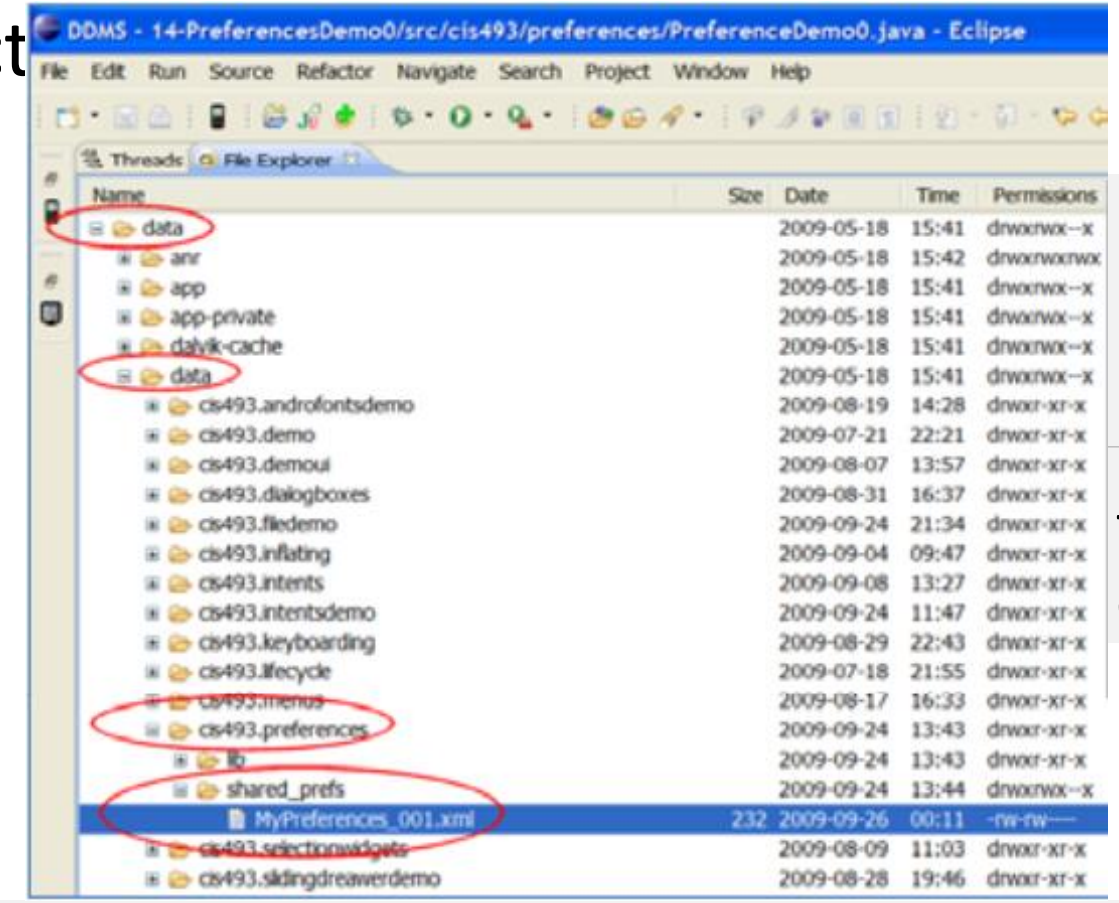


Image of the preference file (obtained by pulling a copy of the file out of the device).

Using DDMS to explore the Device's memory map. Observe the choices made by the user are saved in the *data/data/Shared_prefs/* folder as an XML file.

SharedPreferences

- SharedPreferences sharedpreferences = getSharedPreferences(MyPREFERENCES, Context.MODE_PRIVATE);
- **MODE_APPEND:** This will append the new preferences with the already existing preferences
- **MODE_ENABLE_WRITE_AHEAD_LOGGING:** Database open flag. When it is set , it would enable write ahead logging by default
- **MODE_PRIVATE:** By setting this mode, the file can only be accessed using calling application
- **MODE_WORLD_READABLE:** This mode allow other application to read the preferences
- **MODE_WORLD_WRITEABLE:** This mode allow other application to write the preferences

SharedPreferences

- Editor editor = sharedpreferences.edit();
- editor.putString("key", "value");
- editor.commit();
- **apply():** It is an abstract method. It will commit your changes back from editor to the sharedPreference object you are calling
- **clear():** It will remove all values from the editor
- **remove(String key):** It will remove the value whose key has been passed as a parameter
- **putLong(String key, long value):** It will save a long value in a preference editor
- **putInt(String key, int value):** It will save a integer value in a preference editor
- **putFloat(String key, float value):** It will save a float value in a preference editor
- **contains(String key):** This method is used to check whether the preferences contains a preference.
- **getAll():** This method is used to retrieve all values from the preferences.
- **edit():** This method is used to create a new Editor for these preferences, through which you can make modifications to the data in the preferences and atomically commit those changes back to the SharedPreferences object.

SharedPreferences

- **getBoolean(String key, boolean defValue):** This method is used to retrieve a boolean value from the preferences.
- **getFloat(String key, float defValue):** This method is used to retrieve a float value from the preferences.
- **getInt(String key, int defValue):** This method is used to retrieve an int value from the preferences.
- **getLong(String key, long defValue):** This method is used to retrieve a long value from the preferences.
- **getString(String key, String defValue):** This method is used to retrieve a String value from the preferences.
- **getStringSet(String key, Set defValues):** This method is used to retrieve a set of String values from the preferences.

Storing Data

```
val pref = applicationContext.getSharedPreferences("MyPref", 0) // 0 - for private mode

val editor: Editor = pref.edit()
editor.putBoolean("key_name", true) // Storing boolean - true/false

editor.putString("key_name", "string value") // Storing string

editor.putInt("key_name", "int value") // Storing integer

editor.putFloat("key_name", "float value") // Storing float

editor.putLong("key_name", "long value") // Storing long

editor.commit() // commit changes
```

Retrieving Data

```
val pref = applicationContext.getSharedPreferences("MyPref", 0) // 0 - for private mode

pref.getString("key_name", null) // getting String

pref.getInt("key_name", -1) // getting Integer

pref.getFloat("key_name", null) // getting Float

pref.getLong("key_name", null) // getting Long

pref.getBoolean("key_name", null) // getting boolean
```

Clearing or Deleting Data

- editor.remove("name"); // will delete key name
- editor.remove("email"); // will delete key email
- editor.commit(); // commit changes

- editor.clear();
- editor.commit(); // commit changes

What is JSON?

- **What is JSON?**
- JSON is used for data interchange (posting and retrieving) from the server.
- JSON is the best alternative for XML and its more readable by human.
- A JSON response from the server consists of many fields.

What is JSON?

- An example JSON response/data is given below.

```
{
  "title":"JSONParserTutorial",
  "array":[
    {
    "company":"Google"
    },
    {
      "company":"Facebook"
    },
    {
    "company":"LinkedIn"
    },
    {
      "company" : "Microsoft"
    },
    {
      "company": "Apple"
    }
    ],
    "nested":{
    "flag": true,
    "random_number":1
    }
}
```

- We’ve create a random JSON data string from https://www.jsoneditoronline.org/ page.
- It’s handy for editing JSON data.

JSON data

- JSON data consists of 4 major components that are listed below:
  1. **Array**: A **JSONArray** is enclosed in square brackets ([). It contains a set of objects
  2. **Object**: Data enclosed in curly brackets ({) is a single JSONObject. Nested JSONObjects are possible and are very commonly used
  3. **Keys**: Every JSONObject has a key string that's contains certain value
  4. **Value**: Every key has a single value that can be of any type string, double, integer, boolean etc

Android JSONObject

- Create a JSONObject from the static JSON data string given above and display the JSONArray in a ListView.

JSON - Parsing

- For parsing a JSON object, we will create an object of class JSONObject and specify a string containing JSON data to it. Its syntax is

```
var in1: String = ""
val reader = JSONObject(in1)
```

```
{
   "sys":
   {
      "country":"GB",
      "sunrise":1381107633,
      "sunset":1381149604
   },
   "weather":[
      {
         "id":711,
         "main":"Smoke",
         "description":"smoke",
         "icon":"50n"
      }
   ],

  "main":
   {
      "temp":304.15,
      "pressure":1009,
   }
}
```

JSON-Parsing

- A JSON file consist of different object with different key/value pair e.t.c. So JSONObject has a separate function for parsing each of the component of JSON file. Its syntax is given below –

JSON-Parsing

```
val sys: JSONObject = reader.getJSONObject("sys")
country = sys.getString("country")
val main: JSONObject = reader.getJSONObject("main")
temperature = main.getString("temp")
```

JSON-Parsing

- The method **getJSONObject** returns the JSON object.
- The method **getString** returns the string value of the specified key.

JSON-Parsing

- **get(String name)**
- This method just Returns the value but in the form of Object type
- **getBoolean(String name)**
- This method returns the boolean value specified by the key
- **getDouble(String name)**
- This method returns the double value specified by the key

JSON-Parsing

- **getInt(String name)**
- This method returns the integer value specified by the key
- **getLong(String name)**
- This method returns the long value specified by the key

JSON-Parsing

- **length()**
- This method returns the number of name/value mappings in this object..
- **names()**
- This method returns an array containing the string names in this object.

```
{
    "contacts": [
        {
                "id": "c200",
                "name": "Ravi Tamada",
                "email": "ravi@gmail.com",
                "address": "xx-xx-xxxx,x - street, x - country",
                "gender" : "male",
                "phone": {
                    "mobile": "+91 0000000000",
                    "home": "00 000000",
                    "office": "00 000000"
                }
        },
        {
                "id": "c201",
                "name": "Johnny Depp",
                "email": "johnny_depp@gmail.com",
                "address": "xx-xx-xxxx,x - street, x - country",
                "gender" : "male",
                "phone": {
                    "mobile": "+91 0000000000",
                    "home": "00 000000",
                    "office": "00 000000"
                }
        },
```

SQL Databases

Using SQL databases in Android.

Android (as well as iPhone OS) uses an embedded standalone program called **sqlite3** which can be used to:

create a database, define SQL tables, indices, queries, views, triggers	Insert rows, delete rows, change rows, run queries and administer a SQLite database file.

SQLLite

- Embedded RDBMS
- ACID Compliant
- Size – about 257 Kbytes
- Not a client/server architecture
  - Accessed via function calls from the application
- Writing (insert, update, delete) locks the database, queries can be done in parallel

SQLLite

- Datastore – single, cross platform file (kinda like an MS Access DB)
  - Definitions
  - Tables
  - Indicies
  - Data

SQLite Data Types

- This is quite different than the normal SQL data types so please read:
- **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.

SQLite Data Types

- **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. http://www.sqlite.org/datatype3.html

Storage classes

- **NULL** – null value
- **INTEGER** - signed integer, stored in 1, 2, 3, 4, 6, or 8 bytes depending on the magnitude of the value
- **REAL** - a floating point value, 8-byte IEEE floating point number.
- **TEXT** - 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.

SQLite Data Types

- Boolean Datatype
- SQLite does not have a separate Boolean storage class. Instead, Boolean values are stored as integers 0 (false) and 1 (true).

android.database.sqlite

- Contains the SQLite database management classes that an application would use to manage its own private database.

android.database.sqlite - Classes

- SQLiteCloseable - An object created from a SQLiteDatabase that can be closed.
- SQLiteCursor - A Cursor implementation that exposes results from a query on a SQLiteDatabase.
- SQLiteDatabase - Exposes methods to manage a SQLite database.
- SQLiteOpenHelper - A helper class to manage database creation and version management.
- SQLiteProgram - A base class for compiled SQLite programs.
- SQLiteQuery - A SQLite program that represents a query that reads the resulting rows into a CursorWindow.
- SQLiteQueryBuilder - a convenience class that helps build SQL queries to be sent to SQLiteDatabase objects.
- SQLiteStatement - A pre-compiled statement against a SQLiteDatabase that can be reused.

android.database.sqlite.SQLiteDatabase

- Contains the methods for: creating, opening, closing, inserting, updating, deleting and quering an SQLite database
- These methods are similar to JDBC but more method oriented than what we see with JDBC (remember there is not a RDBMS server running)

Database - Creation

- **openDatabase(String path, SQLiteDatabase.CursorFactory factory, int flags)**
- This method only opens the existing database with the appropriate flag mode. The common flags mode could be
- OPEN_READWRITE
- OPEN_READONLY

SQL Databases

How to create a SQLite database?

```
public static SQLiteDatabase.openDatabase (
                String path,  SQLiteDatabase.CursorFactory factory,  int flags )
```

Open the database according to the flags OPEN_READWRITE OPEN_READONLY CREATE_IF_NECESSARY . Sets the locale of the database to the the system's current locale.

Parameters

path	to database file to open and/or create
factory	an optional factory class that is called to instantiate a cursor when query is called, or null for default
flags	to control database access mode
Returns	the newly opened database
Throws	*SQLiteException* if the database cannot be opened

CursorFactory class

- The reason of passing null is you want the standard SQLiteCursor behaviour.
- If you want to implement a specialized Cursor you can get it by by extending the Cursor class(this is for doing additional operations on the query results).
- And in these cases, you can use the CursorFactory class to return an instance of your Cursor implementation.

Database - Creation

- **openOrCreateDatabase(String path, SQLiteDatabase.CursorFactory factory)**
- It not only opens but create the database if it do not exists. This method is equivalent to openDatabase method.

Database - Creation

- **openOrCreateDatabase(File file, SQLiteDatabase.CursorFactory factory)**
- It takes the File object as a path rather then a string. It is equivalent to file.getPath()

openOrCreateDatabase( )

- This method will open an existing database or create one in the application data area

```
import android.database.sqlite.SQLiteDatabase;

SQLiteDatabase  myDatabase;

myDatabase = openOrCreateDatabase ("my_sqlite_database.db" ,
                    SQLiteDatabase.CREATE_IF_NECESSARY , null);
```

SQLite Database Properties

- Important database configuration options include: version, locale, and thread-safe locking.

```
import java.util.Locale;

myDatabase.setVersion(1);
myDatabase.setLockingEnabled(true);
myDatabase.SetLocale(Locale.getDefault());
```

Location of Database

- In order to see that where is your database is created.
- Open your android studio, connect your mobile.
- Go **tools/android/android device monitor**. Now browse the file explorer tab.
- Now browse this folder **/data/data/<your.package.name>/databases/<database-name>.**


com.journaldev.sharedpreferences 2015-10-18 21:28 drwxr-x--x
com.journaldev.sqlite 2015-10-19 13:32 drwxr-x--x
cache 2015-10-19 13:32 drwxrwx--x
code_cache 2015-10-19 13:32 drwxrwx--x
databases 2015-10-19 13:32 drwxrwx--x
JOURNALDEV_COUNTRIES.DB 20480 2015-10-19 13:37 -rw-rw----
JOURNALDEV_COUNTRIES.... 12824 2015-10-19 13:37 -rw-------
com.journaldev.webview 2015-10-16 12:52 drwxr-x--x

Database - Helper class

- **Android SQLite SQLiteOpenHelper**
- Android has features available to handle changing database schemas, which mostly depend on using the SQLiteOpenHelper class.
- **SQLiteOpenHelper** is designed to get rid of two very common problems.

Database - Helper class

- When the application runs the first time – At this point, we do not yet have a database. So we will have to create the tables, indexes, starter data, and so on.
- When the application is upgraded to a newer schema – Our database will still be on the old schema from the older edition of the app. We will have option to alter the database schema to match the needs of the rest of the app.

Database - Helper class

- For managing all the operations related to the database , an helper class has been given and is called **SQLiteOpenHelper**.
- It automatically manages the creation and update of the database. Its syntax is given below

```
class DBHelper(context: Context,DATABASE_NAME:String) : SQLiteOpenHelper(context, DATABASE_NAME, null, 1) {
    override fun onCreate(db: SQLiteDatabase) {}
    override fun onUpgrade(database: SQLiteDatabase, oldVersion: Int, newVersion: Int) {}
}
```

Database - Helper class

- SQLiteOpenHelper wraps up these logic to create and upgrade a database as per our specifications.
- For that we'll need to create a custom subclass of SQLiteOpenHelper implementing at least the following three methods.

Database - Helper class

- **Constructor**
- This takes the Context (e.g., an Activity), the name of the database, an optional cursor factory (we'll discuss this later), and an integer representing the version of the database schema you are using (typically starting from 1 and increment later).

Database - Helper class

- **onCreate(SQLiteDatabase db)**
- It’s called when there is no database and the app needs one.
- It passes us a SQLiteDatabase object, pointing to a newly-created database, that we can populate with tables and initial data.

Database - Helper class

- **onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion)**
- It’s called when the schema version we need does not match the schema version of the database, It passes us a **SQLiteDatabase** object and the old and new version numbers.
- Hence we can figure out the best way to convert the database from the old schema to the new one.

Opening and Closing Android SQLite Database Connection

```
@Throws(SQLException::class)
fun open(): DBManager {
    dbHelper = DatabaseHelper(context)
    database = dbHelper.getWritableDatabase()
    return this
}

fun close() {
    dbHelper.close()
}
```

Database Table Creation

- we can create table or insert data into table using execSQL method defined in SQLiteDatabase class. Its syntax is given below

```
mydatabase.execSQL("CREATE TABLE IF NOT EXISTS Author(Username VARCHAR,Password VARCHAR);")
execSQL(String sql, Object[] bindArgs)
```

Creating Tables

- Create a static string containing the SQLite CREATE statement, use the execSQL( ) method to execute it.

```
val createAuthor:String = "CREATE TABLE   authors (
id  INTEGER PRIMARY KEY AUTOINCREMENT,
fname  TEXT,
lname  TEXT)"

myDatabase.execSQL(createAuthor)
```

Database - Insertion

- we can create table or insert data into table using execSQL method defined in SQLiteDatabase class. Its syntax is given below
- mydatabase.execSQL("INSERT INTO Author VALUES('admin','admin');");
- **execSQL(String sql, Object[] bindArgs)**
- This method not only insert data , but also used to update or modify already existing data in database using bind arguments

Inserting new Record into Android SQLite database table

- **Content Values** creates an empty set of values using the given initial size.

```
fun insert(name: String?, desc: String?) {
    val contentValue = ContentValues()
    contentValue.put(DatabaseHelper.SUBJECT, name)
    contentValue.put(DatabaseHelper.DESC, desc)
    database.insert(DatabaseHelper.TABLE_NAME, null, contentValue)
}
```

insert( )

- long insert(String table, String nullColumnHack, ContentValues values)

```
import  android.content.ContentValues;

val  values:ContentValues = ContentValues( );
values.put("firstname" , "J.K.");
values.put("lastname" , "Rowling");
val newAuthorID:Long =  myDatabase.insert("tbl_authors" , "" , values);
```

Android insert datetime value in SQLite database

- **Inserting current timestamp by default**
- If you don’t want to insert the timestamp manually each time you create a row, you can do it by keeping the default value while creating the table. Use the **DEFAULT** keyword and one of the following data type.

Android insert datetime value in SQLite database

- **CURRENT_TIME** – Inserts only time
  CURRENT_DATE – Inserts only date
  CURRENT_TIMESTAMP – Inserts both time and date
- CREATE TABLE users(id INTEGER PRIMARY KEY, username TEXT, created_at DATETIME DEFAULT CURRENT_TIMESTAMP);

Android insert datetime value in SQLite database

- **Using datetime() while inserting the row**
- You can also insert datetime manually using **datetime()** function while inserting the row.
- db.execSQL("INSERT INTO users(username, created_at) VALUES('ravitamada', 'datetime()'");

Android insert datetime value in SQLite database

- **Using java Date functions**
- You can also use
  java **Date()** and **SimpleDateFormat()** methods.
  Create a function that returns timestamp and use the value while setting the content value for date column.
- Following function **getDateTime()** returns datetime.

Android insert datetime value in SQLite database

- Following function **getDateTime()** returns datetime.

```
private fun getDateTime(): String? {
    val dateFormat = SimpleDateFormat(
        "yyyy-MM-dd HH:mm:ss", Locale.getDefault()
    )
    val date = Date()
    return dateFormat.format(date)
}
```

Android insert datetime value in SQLite database

- and use the value returned by **getDateTime()** to set content value.

```
ContentValues values = new ContentValues();
values.put('username', 'ravitamada');
values.put('created_at', getDateTime());
// insert the row
long id = db.insert('users', null, values);
```

Updating Record in Android SQLite database table

```
fun update(_id: Long, name: String?, desc: String?): Int {
    val contentValues = ContentValues()
    contentValues.put(DatabaseHelper.SUBJECT, name)
    contentValues.put(DatabaseHelper.DESC, desc)
    return database.update(
        DatabaseHelper.TABLE_NAME,
        contentValues,
        DatabaseHelper._ID.toString() + " = " + _id,
        null
    )
}
```

update( )

- int update(String table, ContentValues values, String whereClause, String[ ] whereArgs)

```
fun updateBookTitle(bookId: Int, newTitle: String?) {
    val values = ContentValues()
    values.put("title", newTitle)
    myDatabase.update(
        "tbl_books", values,
        "id=?", arrayOf(bookId.toString())
    )
}
```

Android SQLite – Deleting a Record

```
fun delete(_id: Long) {
    database.delete(DatabaseHelper.TABLE_NAME, DatabaseHelper._ID.toString() + "=" + _id, null)
}
```

delete( )

- int delete(String table, String whereClause, String[] whereArgs)

```
fun deleteBook(bookId: Int) {
    myDatabase.delete("tbl_books", "id=?", arrayOf(bookId.toString()))
}
```

Android SQLite Cursor

- A Cursor represents the entire result set of the query. Once the query is fetched a call to **cursor.moveToFirst()** is made. Calling moveToFirst() does two things:
- It allows us to test whether the query returned an empty set (by testing the return value)
- It moves the cursor to the first result (when the set is not empty)
- The following code is used to fetch all records:

Database - Fetching

- We can retrieve anything from database using an object of the Cursor class.
- We will call a method of this class called rawQuery and it will return a resultset with the cursor pointing to the table. We can move the cursor forward and retrieve the data.

Database - Fetching

- Cursor resultSet = mydatbase.rawQuery("Select * from Author",null);
- resultSet.moveToFirst();
- String username = resultSet.getString(0);
- String password = resultSet.getString(1);

Database - Fetching

- There are other functions available in the Cursor class that allows us to effectively retrieve the data. That includes
- **getColumnCount()**
- This method return the total number of columns of the table.
- **getColumnIndex(String columnName)**
- This method returns the index number of a column by specifying the name of the column

Database - Fetching

- There are other functions available in the Cursor class that allows us to effectively retrieve the data. That includes
- **getColumnName(int columnIndex)**
- This method returns the name of the column by specifying the index of the column
- **getColumnNames()**
- This method returns the array of all the column names of the table.

Database - Fetching

- There are other functions available in the Cursor class that allows us to effectively retrieve the data. That includes
- **getCount()**
- This method returns the total number of rows in the cursor
- **getPosition()**
- This method returns the current position of the cursor in the table
- **isClosed()**
- This method returns true if the cursor is closed and return false otherwise

- Another way to use a Cursor is to wrap it in a CursorAdapter. Just as ArrayAdapter adapts arrays, CursorAdapter adapts Cursor objects, making their data available to an AdapterView like a ListView.

```
fun fetch(): Cursor? {
    val columns =
        arrayOf<String>(DatabaseHelper._ID, DatabaseHelper.SUBJECT, DatabaseHelper.DESC)
    val cursor: Cursor =
        database.query(DatabaseHelper.TABLE_NAME, columns, null, null, null, null, null)
    if (cursor != null) {
        cursor.moveToFirst()
    }
    return cursor
}
```

Queries

- Method of SQLiteDatabase class and performs queries on the DB and returns the results in a Cursor object
- Cursor c = mdb.query(p1,p2,p3,p4,p5,p6,p7)
  - p1 ; Table name (String)
  - p2 ; Columns to return (String array)
  - p3 ; WHERE clause (use null for all, ?s for selection args)
  - p4 ; selection arg values for ?s of WHERE clause
  - p5 ; GROUP BY (null for none) (String)
  - p6 ; HAVING (null unless GROUP BY requires one) (String)
  - p7 ; ORDER BY (null for default ordering)(String)
  - p8 ; LIMIT (null for no limit) (String)

Simple Queries

- *SQL* - "SELECT * FROM ABC;"
  SQLite - Cursor c = mdb.query(abc,null,null,null,null,null,null);

- *SQL* - "SELECT * FROM ABC WHERE C1=5"
  SQLite - Cursor c = mdb.query(
  abc,null,"c1=?" , new String[ ] {"5"},null,null,null);

- SQL – "SELECT title,id FROM BOOKS ORDER BY title ASC"
  SQLite – String colsToReturn [ ] {"title","id"};
  String sortOrder = "title ASC";
  Cursor c = mdb.query("books",colsToReturn,
  null,null,null,null,sortOrder);

android.database

- http://developer.android.com/reference/android/database/package-summary.html
- Contains classes and interfaces to explore data returned through a content provider.
- The main thing you are going to use here is the Cursor interface to get the data from the resultset that is returned by a query

http://developer.android.com/reference/android/database/Cursor.html

```
import android.content.ContentValues
import android.content.Context
import android.database.Cursor
import android.database.DatabaseUtils
import android.database.sqlite.SQLiteDatabase
import android.database.sqlite.SQLiteOpenHelper
class DBHelper(context: Context?) :
    SQLiteOpenHelper(context, DATABASE_NAME, null, 1) {
    private val hp: HashMap<*, *>? = null
    override fun onCreate(db: SQLiteDatabase) {
        db.execSQL(
            "create table contacts " +
                    "(id integer primary key, name text,phone text,email text, street text,place text)"
        )
    }
    override fun onUpgrade(db: SQLiteDatabase, oldVersion: Int, newVersion: Int) {
        db.execSQL("DROP TABLE IF EXISTS contacts")
        onCreate(db)
    }
```

```
fun insertContact(
    name: String?,
    phone: String?,
    email: String?,
    street: String?,
    place: String?
): Boolean {
    val db = this.writableDatabase
    val contentValues = ContentValues()
    contentValues.put("name", name)
    contentValues.put("phone", phone)
    contentValues.put("email", email)
    contentValues.put("street", street)
    contentValues.put("place", place)
    db.insert("contacts", null, contentValues)
    return true
}

fun getData(id: Int): Cursor {
    val db = this.readableDatabase
    return db.rawQuery("select * from contacts where id=$id", null)
}
```

```
fun numberOfRows(): Int {
    val db = this.readableDatabase
    return DatabaseUtils.queryNumEntries(db, CONTACTS_TABLE_NAME).toInt()
}
fun updateContact(id: Int?, name: String?, phone: String?, email: String?, street: String?, place: String?): Boolean {
    val db = this.writableDatabase
    val contentValues = ContentValues()
    contentValues.put("name", name)
    contentValues.put("phone", phone)
    contentValues.put("email", email)
    contentValues.put("street", street)
    contentValues.put("place", place)
    db.update("contacts", contentValues, "id = ? ", arrayOf(Integer.toString(id!!)))
    return true
}

fun deleteContact(id: Int?): Int {
    val db = this.writableDatabase
   return db.delete("contacts","id = ? ", arrayOf(Integer.toString(id!!)))
}
```

```
val allCotacts: ArrayList<String>
    get() {
        val array_list = ArrayList<String>()
        val db = this.readableDatabase
        val res = db.rawQuery("select * from contacts", null)
        res.moveToFirst()
        while (res.isAfterLast == false) {
            array_list.add(res.getString(res.getColumnIndex(CONTACTS_COLUMN_NAME)))
            res.moveToNext()
        }
        return array_list
    }

companion object {
    const val DATABASE_NAME = "MyDBName.db"
    const val CONTACTS_TABLE_NAME = "contacts"
    const val CONTACTS_COLUMN_ID = "id"
    const val CONTACTS_COLUMN_NAME = "name"
    const val CONTACTS_COLUMN_EMAIL = "email"
    const val CONTACTS_COLUMN_STREET = "street"
    const val CONTACTS_COLUMN_CITY = "place"
    const val CONTACTS_COLUMN_PHONE = "phone"


}
```

Androidx Room

```
import androidx.room.Dao
import androidx.room.Insert
import androidx.room.Query


@Dao
interface BookDao {

    @Insert
    fun saveBook(bookEntity: BookEntity)

    @Query( value: "Select * from BookEntity")
    fun readAll() : List<BookEntity>

    @Query( value: "Delete from BookEntity where bookId= :id")
    fun deleteBook(id:Int)


    @Query( value: "Update  BookEntity set bookName='Updated' where bookId= :id")
    fun updateBook(id:Int)
}
```

Androidx Room

```java
@Entity(tableName = "word_table")
public class Word {

    @PrimaryKey
    @NonNull
    @ColumnInfo(name = "word")
    private String mWord;

    public Word(String word) {this.mWord = word;}

    public String getWord(){return this.mWord;}
}
```

```java
@Dao
public interface WordDao {

    // allowing the insert of the same word multiple times by passing a
    // conflict resolution strategy
    @Insert(onConflict = OnConflictStrategy.IGNORE)
    void insert(Word word);

    @Query("DELETE FROM word_table")
    void deleteAll();

    @Query("SELECT * from word_table ORDER BY word ASC")
    List<Word> getAlphabetizedWords();
}
```

SQL Databases

Questions