File I/O and Shared Preferences

Data Storage In Android

- Shared Preferences:-Store private primitive data in key-value pairs.
- Internal Storage:-Store private data on the device memory.
- External Storage:-Store public data on the shared external storage.
- SQLite Databases:-Store structured data in a private database.
- Network Connection:-Store data on the web with your own network server.

Shared Preferences

- Useful for **storing and retrieving primitive data** in **key value pairs**.
- **Lightweight usage**, such as saving application settings.
- Typical usage of SharedPreferences is for **saving** application such as **username and password, auto login flag, remember-user flag** etc.

Shared Preferences Contd.....

- The shared preferences **information is stored** in an **XML** file on the device
  - Typically in/data/data/<Your Application's package name>/shared_prefs
- SharedPreferences can be associated with the entire application, or to a specific activity.
- Use the getSharedPrefernces() method to get access to the preferences

Shared Preferences Contd.....

- Example:
  - SharedPrefernces prefs = this.getSharedPrefernces('myPrefs, MODE_PRIVATE')
- If the preferences XML file exist, it is opened, otherwise it is created.
- To Control **access permission to the file**:
  - MODE_PRIVATE:private only to the application
  - MODE_WORLD_READABLE:all application can read XML file
  - MODE_WORLD_WRITABLE:all application can write XML file

Shared Preferences Contd.....

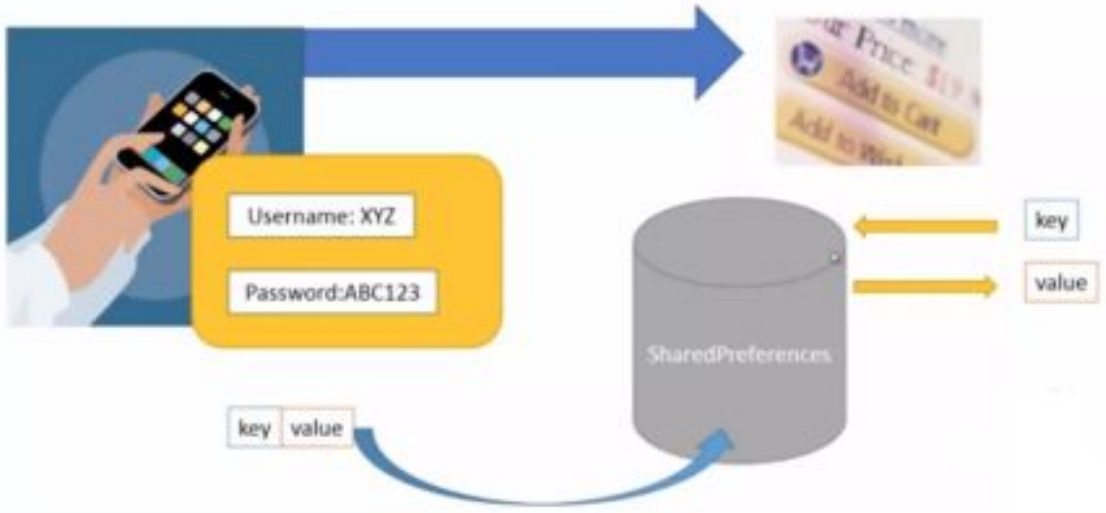
- To add Shared preferences, first an editor object is needed
  - Editor prefsEditor = prefs.edit();
- Then,use the put() method to add the key-value pairs
  - prefsEditor.putString("username","D-Link");
  - prefsEditor.putString("password","vlsi#1@2");
  - prefsEditor.putint("times-login",1);
  - prefsEditor.commit();

Shared Preferences Contd.....

- To retrieve shared preferences data:
  - String username = prefsEditor.getString("username"," ");
  - String password = prefsEditor.getString("password"," ");
- If you are using SharedPrefernces for **specific activity**, then use **getPreferences()** method
  - No need to specify the name of the preferences file

Example

SharedPreferences



Internal Storage

- Android can save files **directly to the device internal storage**.
- These files are **private to the application** and will be removed if you uninstall the application.
- We can create a file using **openFileOutput()** with parameter as file name and the operating mode.
- Generally not recommended to use files.

Internal Storage Contd....

- Similarly, we can open the file using **openFileInput()** passing the parameter as the **filename with extension**.
- File are use to **store large amount of data**
- Use **I/O interfaces** provided by **java.io.*** libraries to read/write files.
- **Only local files** can be accessed.

File Operation(Read)

- Use **context.openFileInput(string name)** to open a private input file stream related to a program.
- Throw **FileNotFoundException** when file does not exist.
- Syntax:-

fileinputStram.in=this.openfileinput(“xyz.txt”)

.
.
.
.

In.close()://Close input stream

File Operation (Write)

- Use **context.openFileOutput(string name,int mode)** to open a private output file stream related to a program.
- The file will be created if it does not exist.
- Output stream can be opened in append mode, which means new data will be appended to end of the file.

  String mystring="Hello World"

File Operation (write) Contd....

- Syntax:-

```
FileOutputStream outfile = this.openFileOutput("myfile.txt",MODE_APPEND)
//Open and Write in"myfile.txt",using append mode.

Outfile.write(mystring.getBytes());
Outfile.close();//close output stream
```

External Storage

- Every Android-compatible device supports a shared "**external storage**" that you can use to save files
  - Removable storage media (such as an SD card)
  - Internal (non-removable) storage
- File saved to the external storage are world readable and can be modified by the user when they enable USB mass storage to transfer files on computer.
- These files are **private to the application** and will be **removed** when the application is uninstalled.

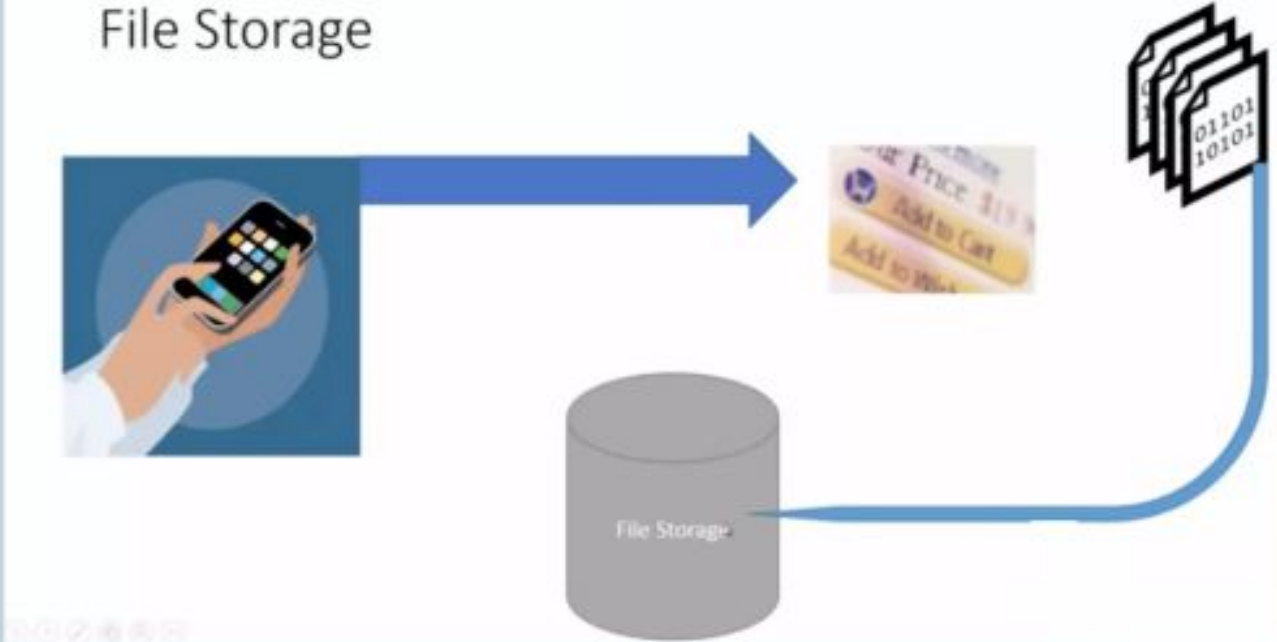
External Storage Continue

- Must check whether external storage is available first by calling **getExternalStorageState()**
  - Also check whether it allows read/write before reading/writing on it
- getExternalFilesDir() takes a parameter such as DIRECTORY_MUSIC,DIRECTORY_RINGTONE etc,to open specific type of subdirectories.
- For **public** shared directories,use **getExternalStoragePublicDirectory()**

External Storage Contd.....

- For **cache files**,use **getExternalCacheDir()**
- All these are applicable for **API level 8 or above**
- For API level 7 or below ,use the method;
  - **getExternalStorageDirectory()**
  - Private files stored in//Android/data/<package_name>/files/
  - Cache files stored in//Android/data/<package_name>/cache/

Example



SQLite

- Android SQLite is a very lightweight database which comes with Android OS.
- Android SQLite combines a clean SQL interface with a very small memory footprint and decent speed.
- SQLite is a open source SQL database that stores data to a text file on a device.
- Supports all the relational database features
- Once a database is created successfully its located in data/data/APP_Name/databases/DATABASE_NAME accessible from Android Device Monitor.

SQLite Databases

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

- **android.database.sqlite.SQLiteDatabase** Contains the methods for: creating, opening, closing, inserting, updating, deleting and quering an SQLite 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.

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);

Creating Tables

- Create a static string containing the SQLite CREATE statement, use the execSQL( ) method to execute it.
  - String createAuthor = "CREAT TABLE authors (
    id INTEGER PRIMARY KEY AUTOINCREMENT,
    fname TEXT,
    lname TEXT);
    myDatabase.execSQL(createAuthor);

insert( ), delete( )

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

```
import android.content.ContentValues;
ContentValues values = new ContentValues( );
values.put("firstname" , "J.K.");
values.put("lastname" , "Rowling");
long newAuthorID = myDatabase.insert("tbl_authors" , "" ,
values);
```

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

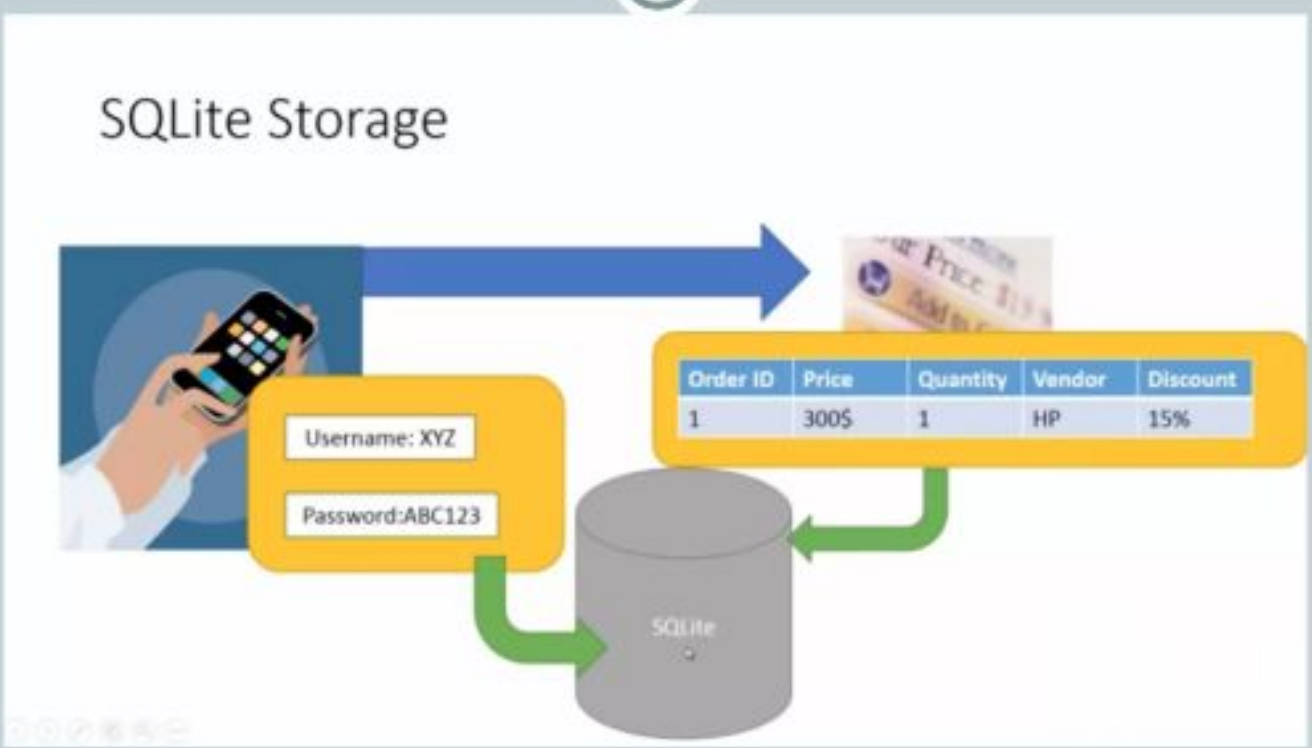
```
public void deleteBook(Integer bookId) {
myDatabase.delete("tbl_books" , "id=?" ,
new String[ ] { bookId.toString( ) } ) ;
```

Update()

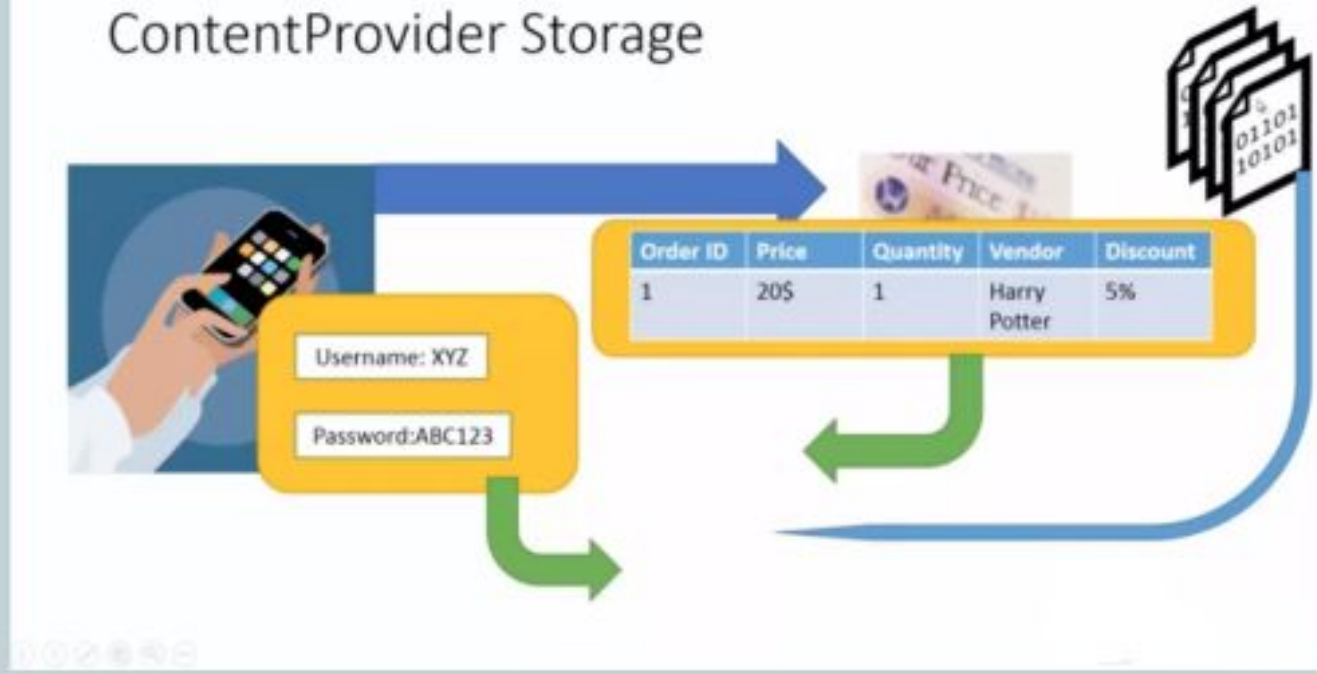
- int update(String table, ContentValues values, String whereClause, String[ ] whereArgs)

```
public void updateBookTitle(Integer bookId, String          newTitle) {
  ContentValues  values = new ContentValues();
  values.put("title" , newTitle);
  myDatabase.update("tbl_books" ,  values ,
  "id=?" , new String[ ] {bookId.toString() } );
}
```

SQLite Storage



Content Provider



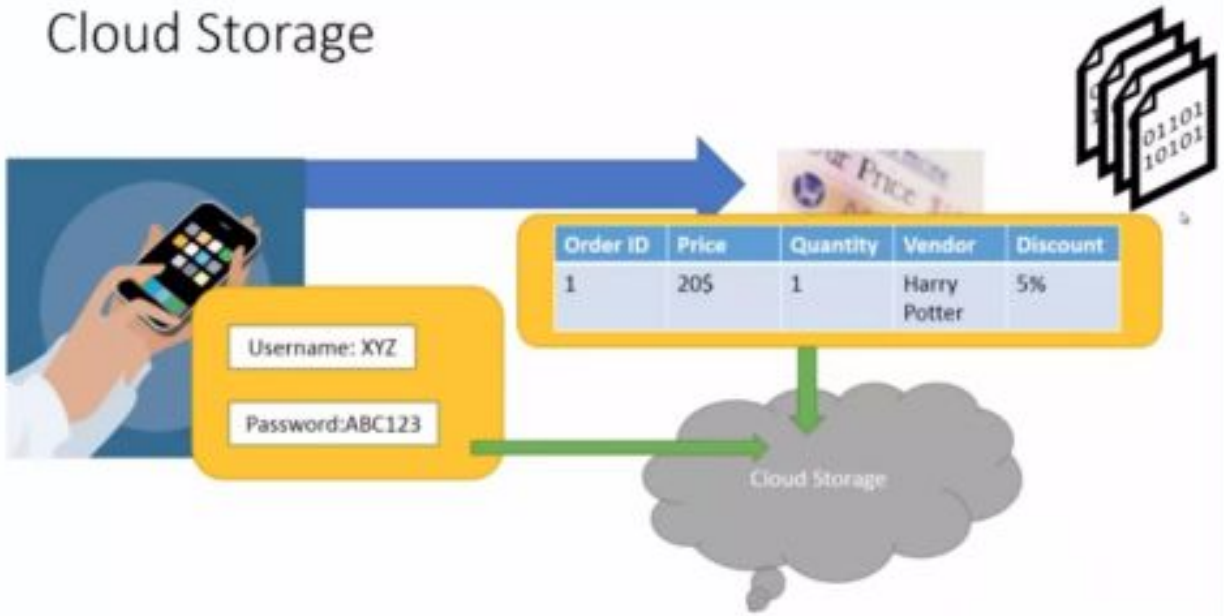
Cloud Storage

- Online file storage centres or cloud storage providers allow you to safely upload your files to the Internet.

Cloud Storage Contd.....

- There are various providers of cloud storage
- Examples:
  - Apple iCloud(Gives 5GB of free storage)
  - Dropbox(Gives 2GB of free storage)
  - Google Drive(Gives 15GB of free storage)
  - Amazon Cloud Drive(Gives 5GB of free storage
  - Microsoft SkyDrive(Gives 7GB of free storage)

Example


Cloud Storage
01101
10101
Order ID
Price
Quantity
Vendor
Discount
1
20$
1
Harry Potter
5%
Username: XYZ
Password:ABC123
Cloud Storage

Shared preferences

https://www.youtube.com/watch?v=jiD2fxn8iKA&t=498s

Writing in a file

https://www.youtube.com/watch?v=wc4p6sYR3B4&t=211s

Reading from a file

https://www.youtube.com/watch?v=0R3mT6L5F6s

SQlite CRUD operations

https://www.youtube.com/watch?v=BcpVIXo2F3U