Utilization of data security and privacy tools.
The following tools were used in designing the project.
- **Python3 -** Python security is to always sanitize data (remove sensitive information) from external sources whether the data originates from a user input form, scraping a website, or a database request.
- SHA256 - a mathematical algorithm found in hashlib module that encrypts data and provides decryption of data when needed.
- Hashlib module is a python 3 module which provides several encryption algorithms.
- The MySQL MariaDB variant is a fast database that ensures database authorizations using the blowfish algorithm and assigns special permissions to users.

Overall architecture;
1. **MySQL**
   MySQL is a relational Database Administration framework which is a free Open Source Program Beneath GNU Permit. It is additionally supported by Prophet Company i.e. Oracle .It is quick , versatile, simple to utilize database administration Framework. MYSQL bolster numerous operation frameworks like Windows, Linux, MacOS etc.
   MySQL is an Organized Inquiry Dialect which is utilized to control, oversee and recover information with the assistance of different Queries. MySQL is created and backed by MySQL AB which could be a Swedish Company and composed in C and C++ programming dialect. It was created by Michael Widenius and David Hughes .It is frequently used to say that MYSQL is named after the girl of the co-founder MIchael Widenius whose title is 'My'.

2. **MariaDB**
   MariaDB is a fork of MySQL, and that is why the two share many similarities. It was created by the original MySQL developers. Its DBMS comes with data processing capabilities for small and enterprise tasks
    You can think of MariaDB as an improved MySQL version. It is shipped with many powerful inbuilt features and usabilities, performance, and security improvements that are not available in MySQL.

   MariaDB is fully GPL licensed and it has been made available to everyone. It is now in the top 10 list of the most widely used Database management systems worldwide. Some of the top companies using this database include Wikipedia, Google, Tumblr, Ubuntu, Amazon Web Services, RedHat, and others. You can use it on Windows, Linux, and Mac OS. It is safe, easy to master, and convenient, and this can be attributed to its growing popularity.

   MariaDB uses the client/server architecture with the main Database and many clients that request and manipulate the data. Clients use SQL statements to interact with the server and to retrieve data and present the results of manipulations on the client-side. It uses similar security measures as MySQL.

3. **Python3**

Python3 is a high-level, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation.Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured, object-oriented and functional programming. It is often described as a "batteries included" language due to its comprehensive standard library.

Guido van Rossum began working on Python in the late 1980s as a successor to the ABC programming language and first released it in 1991 as Python 0.9.0.Python 2.0 was released in 2000 and introduced new features such as list comprehensions, cycle-detecting garbage collection, reference counting, and Unicode support. Python 3.0, released in 2008, was a major revision that is not completely backward-compatible with earlier versions. Python 2 was discontinued with version 2.7.18 in 2020.Python consistently ranks as one of the most popular programming languages.

4. **Linux**
Linux is one of the most popular versions of the UNIX operating System. It is open source as its source code is freely available. It is free to use. Linux was designed considering UNIX compatibility. Its functionality list is quite similar to that of UNIX.
Linux Operating System has primarily three components

- Kernel − Kernel is the core part of Linux. It is responsible for all major activities of this operating system. It consists of various modules and it interacts directly with the underlying hardware. Kernel provides the required abstraction to hide low level hardware details to system or application programs.

- System Library − System libraries are special functions or programs using which application programs or system utilities access Kernel's features. These libraries implement most of the functionalities of the operating system and do not require kernel module's code access rights.

- System Utility − System Utility programs are responsible to do specialized, individual level tasks.

5.Visual Studio
Visual Studio Code is a lightweight open source text editor developed under Microsoft and can be contributed to through the GitHub repository vscode. Extra functionality for Visual Studio Code is provided by means of extensions, which can also be developed by third party developers.

FUNCTIONALITIES
1. **Insert data**

INSERT statement in SQL Server is used for adding records in a table within the specified database. SQL Server performs insertion operation in two ways within a single query: Add data in a single row. Add data in multiple rows.

2. **Get data**
This function is used to retrieve data in the database.

3. **Update data**
The update() function allows the database server to handle in-place updates of opaque data type values, improving the performance for an opaque type that has an expensive constructor.

4. **Environment**
This section lists environment variables that are used directly or indirectly by MySQL. Most of these can also be found in other places in this manual.

5. **Reset data**
This function will be used to reset user data and update the database with new details.

SECURITY FEATURES

1. **OpenSSL**
OpenSSL is a software library for applications that secure communications over computer networks against eavesdropping or need to identify the party at the other end. It is widely used by Internet servers, including the majority of HTTPS websites. It contains an open-source implementation of the SSL and TLS protocols.

2. **Hashlib**
The Python hashlib module is an interface for hashing messages easily. This contains numerous methods which will handle hashing any raw message in an encrypted format.The core purpose of this module is to use a hash function on a string, and encrypt it so that it is very difficult to decrypt it.
This module implements a common interface to many different secure hash and message digest algorithms. Included are the FIPS secure hash algorithms SHA1, SHA224, SHA256, SHA384, and SHA512 (defined in FIPS 180-2) as well as RSA's MD5 algorithm (defined in internet RFC 1321). In this project SHA256 is being used.

Limitations of security features used in the project.
- Openssl is based on data transport and provides encryption during data transit. Some information in the network is not encrypted and thus proves difficult in encrypting some data.
- Form fields such as encrypting user names does not prove efficient. The only options may be encrypting user email, password, credit card information etc.
- Storing data which is encrypted takes CPU activity and memory to perform the encryption and decryption during login and signup.
- Some features in encryption prove to be difficult to implement in your code with some requiring entirely importing modules or frameworks.

Project Running and Installation.

Step 1. Unzip the file and open the new folder from the zip. Or clone the project from github and navigate to the repository.

Step 2. Open Terminal and list directory contents if you are on Linux, its simply *ls* command and on windows *Get-ChildItem*

```
A ~/data-enc git  main ) ls
config  config.py  databases  __init__.py  main.py  __pycache__  README.md  src
A ~/data-enc git  main ) 
```

Step 3. Run the file main.py using python3.

```
A ~/data-enc git  main ) python3 main.py
1. Login
2. Register
3. Exit
4. Reset
Enter your choice:
```

Those are the available options. Every transaction is happening from the file in **srs/app.py.** This is the class file.