1. Introduction:

1.1 Motivation:

World is currently going through a internet revolution. More and more people are coming online for simple social media reasons to online payments. Thus one problem always arrives which is data protection. A simple password is used to protect all this data which itself is vulnerable. Thus finding a method to protect this passwords motivated us to choose this topic.

1.2 Problem statement:

The current scenario on internet is to login on different websites to with different usernames with different passwords which had to be remembered for login. Users may forgot their passwords which result wastage of their time in trying to reset their passwords. To avoid this people set similar passwords for most of their accounts which compromises their security.

The password management application saves the passwords of different websites in one single application and uses encryption methods to securely store them. So user can access all saved passwords by just login into only one application. The application also suggests strong passwords for websites to increase security of current password. Application also aims to make storing the passwords as simple as possible but without compromising on security.

1.3 Objectives:

1. To store passwords in a single application to make them easily accessible.

2. To secure them by applying encryption.

2. Literature Survey:

2.1) Survey of existing system:

In the Era of Online World, people regularly login on different websites. They tend to forgot their passwords, which in result have to waste time on trying to login, calling for help desk, proving their identity,etc. Each problem incident may consume 20-30 minutes of user. This can create great havoc for users who are just to login for their simple tasks.

2.2 Limitation of Existing system or Research gap:

Many people use similar passwords on most of their websites so they do not forget them. But this makes them insecure as a person only needs to know one password in order to get access of all the accounts. People also write down their passwords in certain applications where they are very vulnerable.

2.3 Mini project contribution:

The application has contribution of saving user’s time by storing websites usernames and passwords in a single application while passwords are in encrypted form and can be only accessed by particular user through application’s username and password. Application also provides double layer of security by using privacy pin as means to view or edit stored passwords.

3. Proposed system:

Architecture and framework:

All windows are independent and access methods of two common classes. First is UserDBUtilities class. It contains all database methods like insert , delete, update and retrieve. All these functions are applied on UserDetails database. Another class named PrivateDB is used to perform database operations on PrivateDB database to store private keys.

All the passwords are stored in encrypted form to secure data. These passwords are encrypted using another common class named Encryption. These class contains two methods named decrypt and encrypt which are used by all other classes. Encryption is of RSA standard.

RSA is a asymmetric encryption system meaning it uses two keys known as public and private key which are different. The public key is known and is used for encryption whereas the private key is hidden and is used for decryption. The message cannot be decrypted without the private key. We use two random large prime numbers in this process which are used in key generation process for encryption and decryption. This encryption is based on the fact that finding factors of large composite numbers are really difficult and takes a long time. Finding prime factors of a composite number is known as prime factorization.

Software Requirement specification:

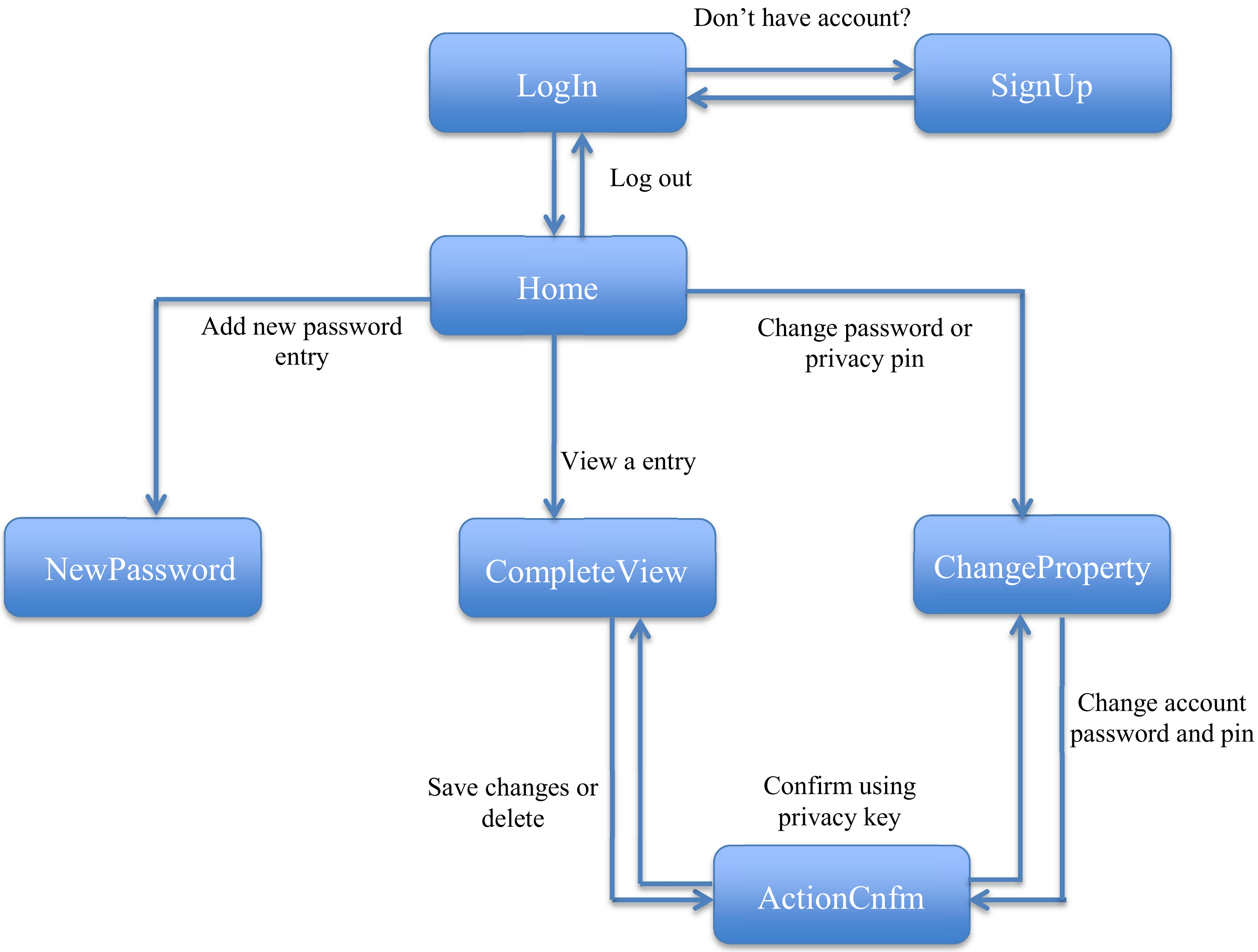
1. Requires latest Java JDK which includes java AWT, java Swing.

2. IDE (like Intellij IDEA, VSCode , Eclipse)

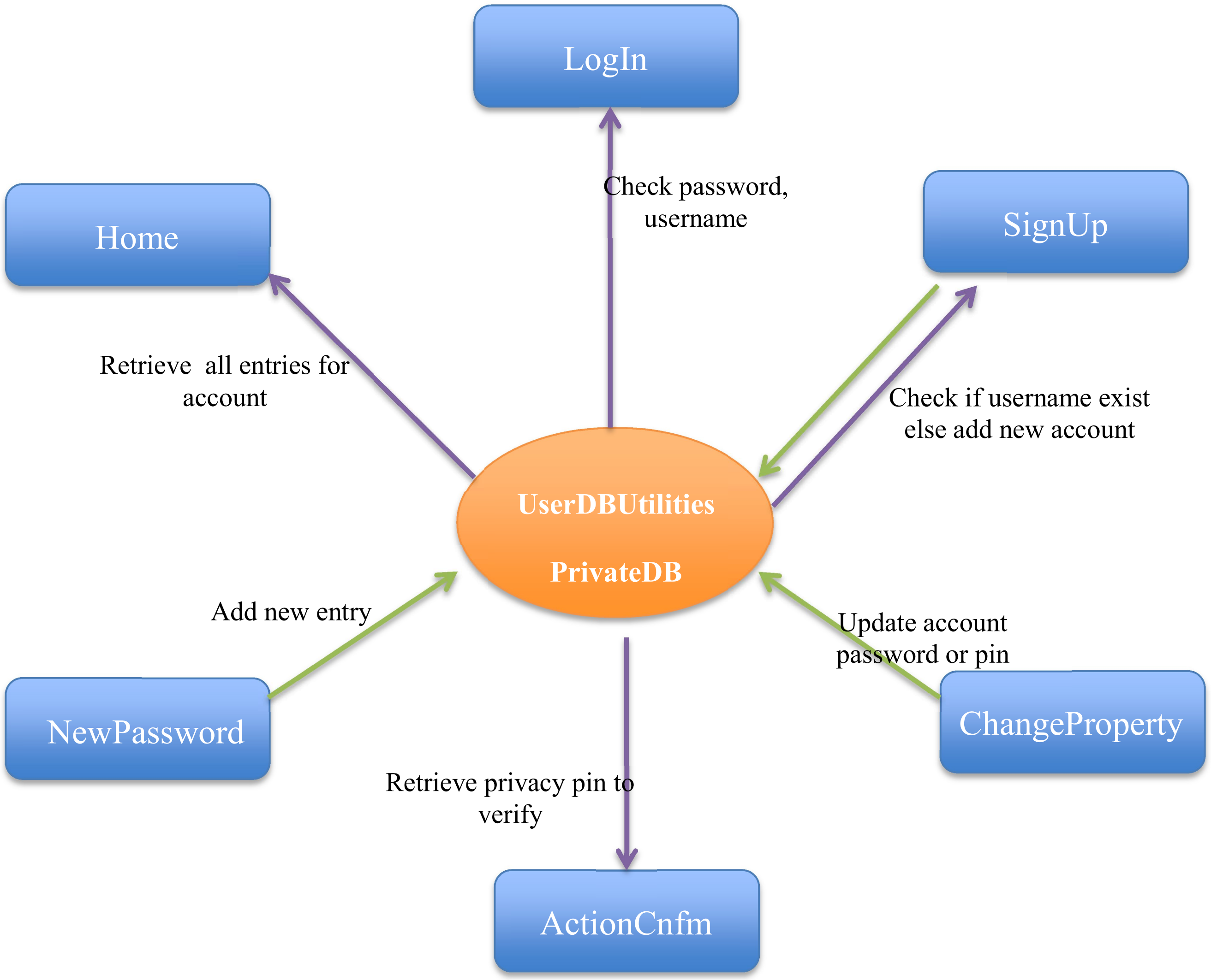
3. Windows OS

Algorithm and process design:

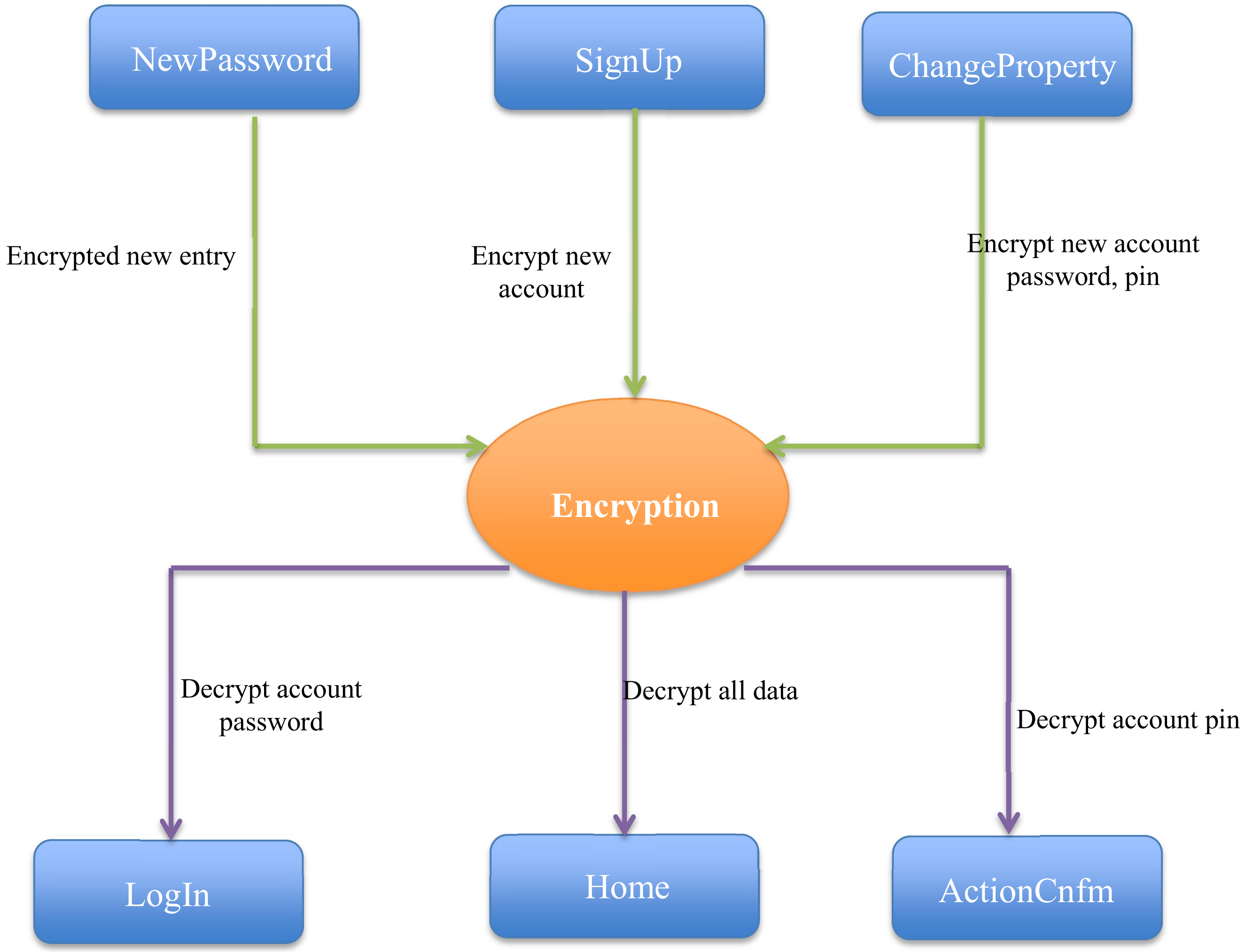
For UI:



For Database:


LogIn
Check password, username
Home
SignUp
Retrieve all entries for account
Check if username exist else add new account
UserDBUtilities
PrivateDB
Add new entry
Update account password or pin
NewPassword
ChangeProperty
Retrieve privacy pin to verify
ActionCnfm

For Encryption:



Implementation Code:

LogIn class:

```
package java_miniproject;

import javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;

public class LogIn {
    JFrame frame;
    JTextField userField;
    JPasswordField pswordField;

    LogIn() {
        frame = new JFrame("PassWarden");
        frame.setSize(750, 450);
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setLayout(new BoxLayout(frame.getContentPane(), BoxLayout.X_AXIS));
        initUi();
        frame.setVisible(true);
    }

    private void initUi() {

        JPanel sidebanner = new JPanel();
        sidebanner.setLayout(new BoxLayout(sidebanner, BoxLayout.Y_AXIS));
        sidebanner.setBackground(Styles.primary_violet);
        sidebanner.setMaximumSize(new Dimension(375, 450));
        JPanel panel_1 = new JPanel(new FlowLayout());
        JPanel panel_2 = new JPanel(new FlowLayout());
        panel_1.setBackground(Styles.primary_violet);
        panel_2.setBackground(Styles.primary_violet);
        ImageIcon appiconImage = new
ImageIcon("src\\java_miniproject\\assets\\app_logo.png");
        frame.setIconImage(appiconImage.getImage());
        JLabel appIcon = new JLabel(appiconImage);
        JLabel appName = new JLabel("PassWarden");
        JLabel slogan = new JLabel("Never forget another password");
        appName.setFont(new Font("Roboto", Font.BOLD, 26));
        slogan.setFont(new Font("Calibri", Font.ITALIC, 16));
        appName.setForeground(Color.WHITE);
        slogan.setForeground(Color.WHITE);
```

```
JPanel panel_3 = new JPanel(new FlowLayout());
panel_3.setBackground(Styles.primary_violet);
JLabel label_1 = new JLabel("Don't have a account ? ");
label_1.setForeground(Color.WHITE);
JButton signupBtn = new JButton("Sign up");
signupBtn.setBackground(Color.WHITE);
signupBtn.setFocusPainted(false);
signupBtn.setBorder(Styles.black_button_border);

panel_1.add(appIcon);
panel_1.add(appName);
panel_2.add(slogan);
panel_3.add(label_1);
panel_3.add(signupBtn);

sidebanner.add(Box.createVerticalStrut(150));
sidebanner.add(panel_1);
sidebanner.add(panel_2);
sidebanner.add(Box.createVerticalStrut(50));
sidebanner.add(panel_3);

JPanel parent = new JPanel();
parent.setLayout(new BoxLayout(parent, BoxLayout.Y_AXIS));
parent.setBackground(Styles.primary_white);
parent.setMaximumSize(new Dimension(500, 450));

JPanel panel1 = new JPanel(new FlowLayout(FlowLayout.LEFT));
panel1.setBackground(Styles.primary_white);
JLabel label1 = new JLabel("Log In");
label1.setFont(Styles.big_label_font);
label1.setForeground(Styles.primary_violet);

JPanel panel2 = new JPanel(new FlowLayout());
panel2.setBackground(Styles.primary_white);
JLabel label2 = new JLabel("Username: ");
userField = new JTextField(16);
userField.setBackground(Color.WHITE);
userField.setFont(Styles.text_field_font);
userField.setBorder(Styles.text_field_border);

JPanel panel3 = new JPanel(new FlowLayout());
panel3.setBackground(Styles.primary_white);
JLabel label3 = new JLabel("Password");
pswordField = new JPasswordField(16);
pswordField.setEchoChar('*');
pswordField.setBackground(Color.WHITE);
pswordField.setFont(Styles.text_field_font);
pswordField.setBorder(Styles.text_field_border);

JPanel panel4 = new JPanel(new FlowLayout());
panel4.setBackground(Styles.primary_white);
JButton loginBtn = new JButton("LogIn");
JButton clearBtn = new JButton("Clear");
loginBtn.setBackground(Styles.primary_button_color);
loginBtn.setForeground(Color.WHITE);
loginBtn.setBorder(Styles.white_button_border);
loginBtn.setFocusPainted(false);
clearBtn.setBackground(Styles.primary_button_color);
clearBtn.setForeground(Color.WHITE);
clearBtn.setBorder(Styles.white_button_border);
clearBtn.setFocusPainted(false);

panel1.add(Box.createHorizontalStrut(150));
panel1.add(label1);
panel2.add(label2);
panel2.add(userField);
panel3.add(label3);
panel3.add(pswordField);
panel4.add(loginBtn);
panel4.add(clearBtn);
parent.add(Box.createVerticalStrut(50));
parent.add(panel1);
parent.add(panel2);
parent.add(panel3);
parent.add(panel4);
frame.add(sidebanner);
frame.add(parent);
frame.getRootPane().setDefaultButton(loginBtn);
clearBtn.addActionListener(new ActionListener() {
   public void actionPerformed(ActionEvent ae) {
      pswordField.setText("");
      userField.setText("");
      pswordField.setBorder(Styles.text_field_border);
   }
});
loginBtn.addActionListener(new ActionListener() {
   public void actionPerformed(ActionEvent ae) {
      try {
         userField.setBorder(Styles.text_field_border);
         UserDBUtilities userDb = new UserDBUtilities();
         PrivateDB privateDb = new PrivateDB();
         String text = userField.getText().strip();
```

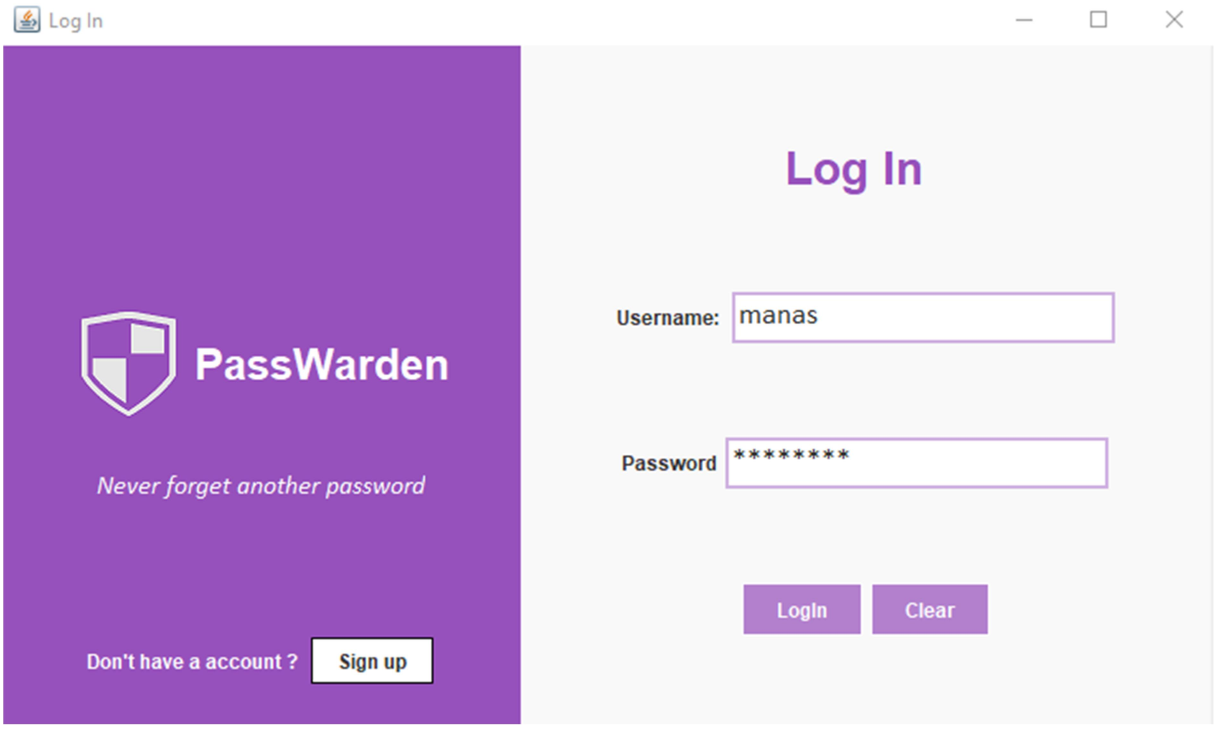
```
                    if(!userDb.checkUser(text)){
                        userField.setBorder(Styles.red_warning_border);
                        return;
                    }
                    String appPswrd_E = userDb.getAccountPassword(text);
                    String appPswrd_pk = privateDb.getAccPasswordKey(text);
                    EncryptedData data = new EncryptedData();
                    data.encryptedPassword = appPswrd_E;
                    data.privateKey = appPswrd_pk;
                    userDb.endConnection();
                    privateDb.endConnection();
                    if(String.valueOf(pswordField.getPassword()).equals(Encryption.decrypt(data)))
{
                        new Home(text);
                        frame.setVisible(false);
                    } else {
                        pswordField.setBorder(Styles.red_warning_border);
                    }
                } catch( Exception e) {
                    System.out.println(e.getMessage());
                    System.out.println("Exception at login");
                }
            }
        });
        signupBtn.addActionListener(new ActionListener() {
            public void actionPerformed(ActionEvent ae) {
                frame.setVisible(false);
                new SignUp(frame);
            }
        });
    }

    public static void main(String[] args) {
        SwingUtilities.invokeLater(new Runnable() {
            public void run() {
                new LogIn();
            }
        });
    }
}
```

Encryption class:

```
package java_miniproject;

//import javax.crypto.Cipher;

import javax.crypto.Cipher;
import java.nio.charset.StandardCharsets;
import java.security.*;
import java.security.spec.PKCS8EncodedKeySpec;
import java.util.Base64;

class EncryptedData{
    //encrypted password will go in User data base
    //privateKey will go in private data base
    String encryptedPassword,privateKey;
}
public class Encryption {
    public static EncryptedData encrypt(String password)throws Exception{
        //Creating a Signature object
        Signature sign = Signature.getInstance("SHA256withRSA");

        //Creating KeyPair generator object
        KeyPairGenerator keyPairGen = KeyPairGenerator.getInstance("RSA");

        //Initializing the key pair generator
        keyPairGen.initialize(2048);
        //Generate the pair of keys
        KeyPair pair = keyPairGen.generateKeyPair();

        //Getting the public key from the key pair
        PublicKey publicKey = pair.getPublic();
        PrivateKey privateKey = pair.getPrivate();
        //Creating a Cipher object
        Cipher cipher = Cipher.getInstance("RSA/ECB/PKCS1Padding");
        byte[] privateKeyBytes=privateKey.getEncoded();
        String privateKeyStr=Base64.getEncoder().encodeToString(privateKeyBytes);
        cipher.init(Cipher.ENCRYPT_MODE, publicKey);
        byte[] passwordBytes=password.getBytes();
        cipher.update(passwordBytes);
        byte[] cipherText = cipher.doFinal();
        EncryptedData data=new EncryptedData();
        data.encryptedPassword=Base64.getEncoder().encodeToString(cipherText);
        data.privateKey=privateKeyStr;
        return data;
    }
    public static String decrypt(EncryptedData data)throws Exception{
        Cipher cipher = Cipher.getInstance("RSA/ECB/PKCS1Padding");
        String encryptedKey=data.privateKey;
        byte[]
privateKeyByte=Base64.getDecoder().decode(encryptedKey.getBytes(StandardCharsets.UTF
_8));
        PKCS8EncodedKeySpec spec=new PKCS8EncodedKeySpec(privateKeyByte);
        KeyFactory keyFact=KeyFactory.getInstance("RSA");
        PrivateKey privateKey=keyFact.generatePrivate(spec);
        cipher.init(Cipher.DECRYPT_MODE, privateKey);
        byte[]
cipherText=Base64.getDecoder().decode(data.encryptedPassword.getBytes(StandardCharsets
.UTF_8));
        //Decrypting the text
        byte[] decipheredText = cipher.doFinal(cipherText);
        return new String(decipheredText);
    }
}
```

Output Screenshots:

1. LogIn form:

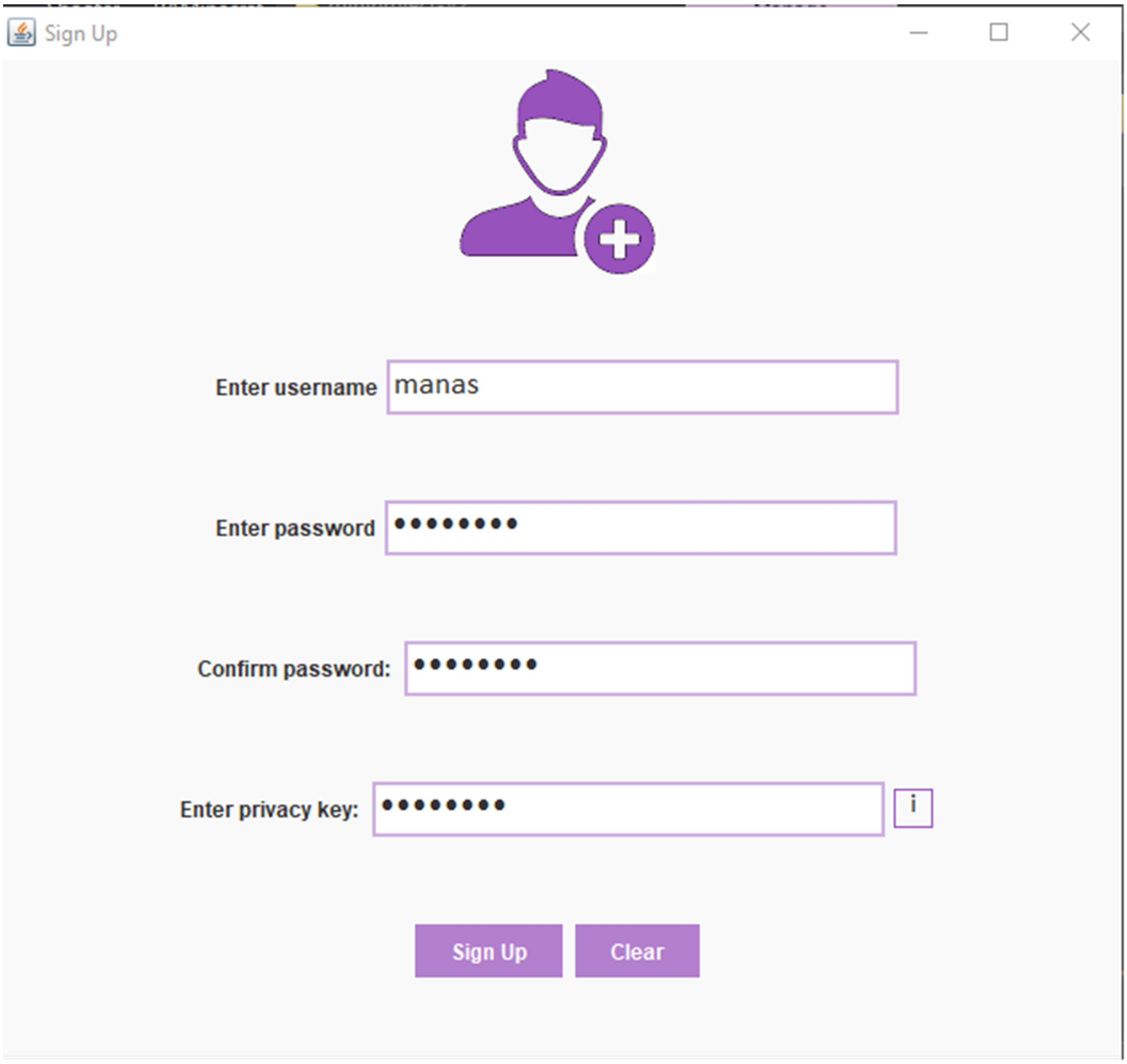


Username: manas

Password ********

It is a log in form to log in the application using application account password. While logging it checks if user exits, if not then highlights username textfield to indicate user is wrong. It also includes button open sign up window.

SignUp



Sign Up

Enter username manas

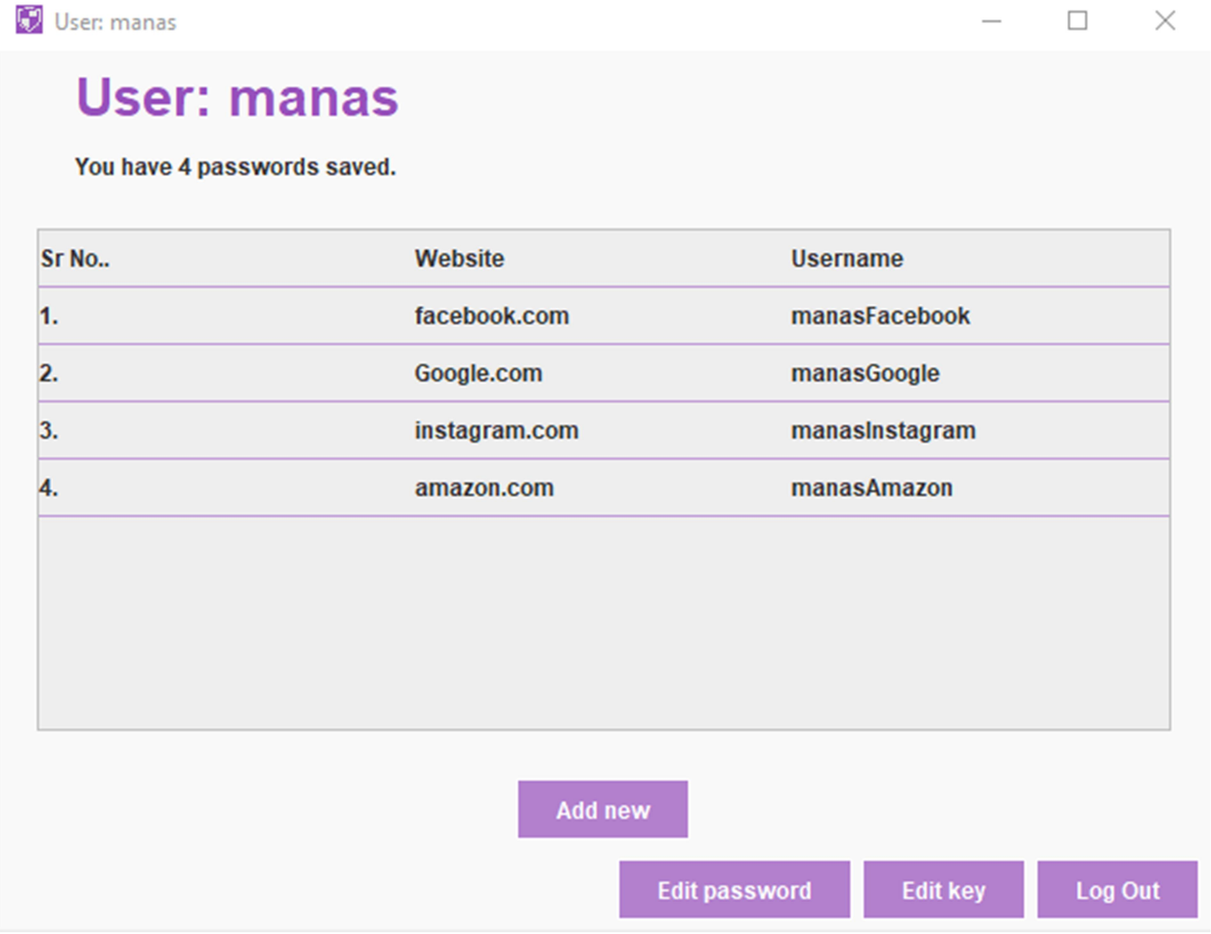
Enter password ••••••••

Confirm password: ••••••••

Enter privacy key: ••••••••

SignUp form allows us to create new accounts for application. It is also used to create privacy pin fro application.

Home page



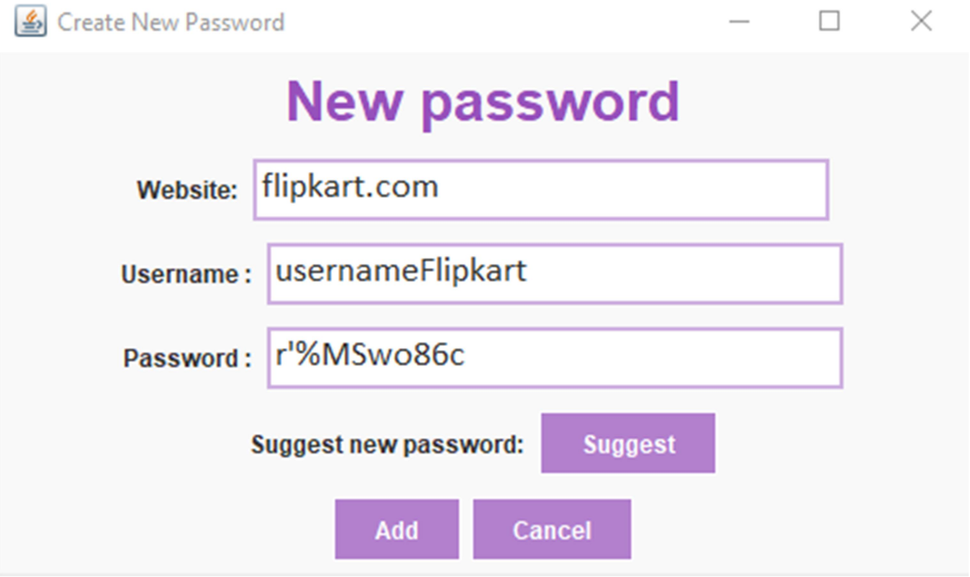
User: manas

You have 4 passwords saved.

Sr No..	Website	Username
1.	facebook.com	manasFacebook
2.	Google.com	manasGoogle
3.	instagram.com	manasInstagram
4.	amazon.com	manasAmazon

Home page consists list of all entries in application for the logged in account. It is also used to navigate to other windows.

NewPassword:



Create New Password

New password

Website: flipkart.com

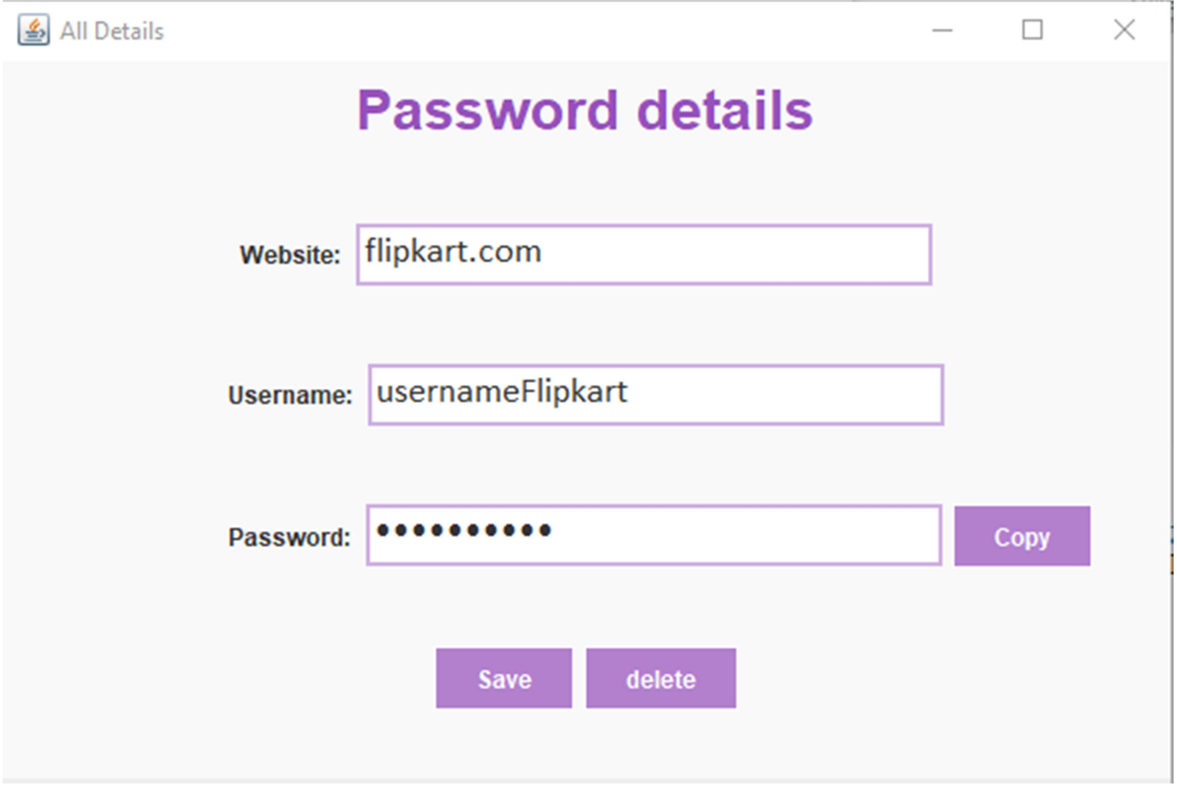
Username : usernameFlipkart

Password : r'%MSwo86c

Suggest new password:

This window is used to create add a new password entry in application. It also suggests strong passwords.

CompleteView:



All Details

Password details

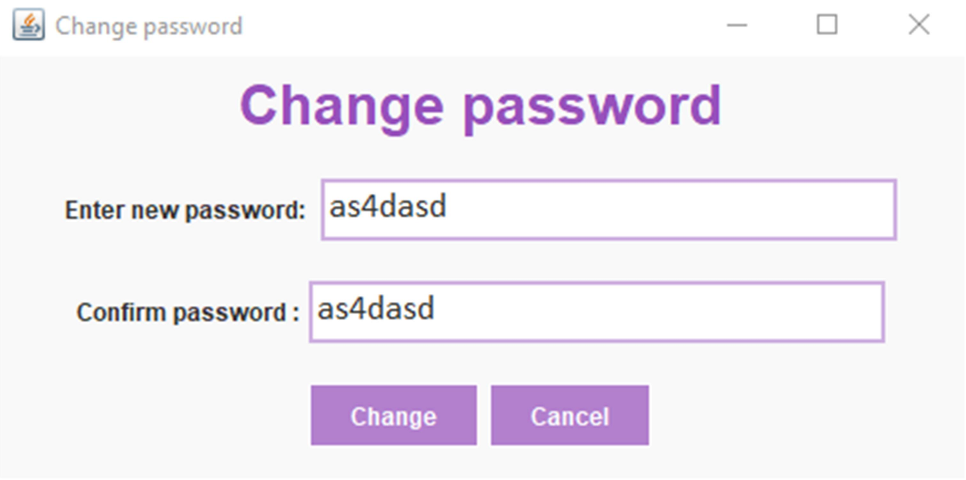
Website: flipkart.com

Username: usernameFlipkart

Password: ●●●●●●●●●●

Complete view displays all details of a particular entry and also provides option to copy password on clipboard.

ChangeProperty:



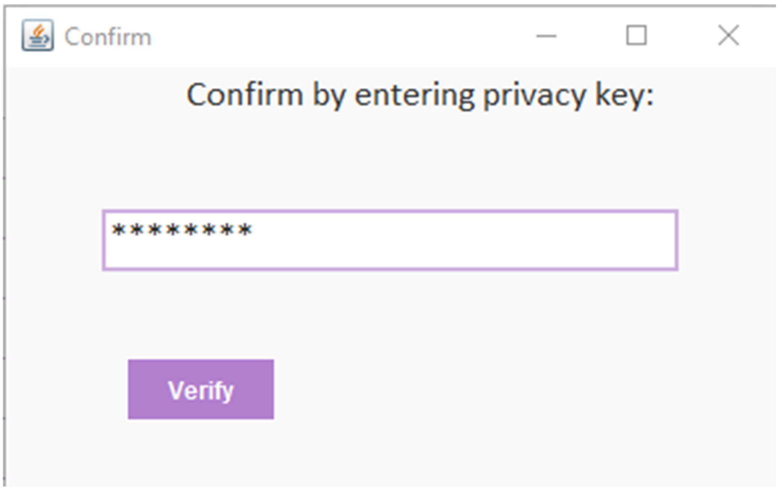
Change password

Enter new password: as4dasd

Confirm password : as4dasd

To change password or privacy pin of application account.

ActionCnfm:



Confirm by entering privacy key:

****

A dialog box to enter privacy pin to perform all operations like change password, delete a password, and view all details of a password.

4.) Conclusion:

1. Thus we conclude that we have a application made in Java to help people to protect their passwords indirectly protecting their invaluable data.

2. Its GUI aims to make application as easy as possible to use.

3. So all these features make the application ready to general use.

6.) Future Work:

1. In future we application can be hosted on a server so it become acccessible on any device with internet connection.

2. Also more than just passwords , sensitive information like official documents and notes can be stored in the application.

7. References:

1. RSA algorithm :- Wikipedia.com

2. Java the complete reference :- by Herbert Schildt