CS3231 INFORMATION SYSTEM SECURITY LAB MANUAL

Academic Year: 2023 – 2024|Jan-May
Course ISS Lab

OBJECTIVES:

The student should be made to:

- ➢ Learn to implement the algorithms DES, RSA, MD5,SHA-1
- ➢ Learn to use network security tools like GnuPG, KF sensor, Net Strumbler

LIST OF EXPERIMENTS:

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:
    a) Caesar Cipher
    b) Playfair Cipher
    c) Hill Cipher
    d) Vigenere Cipher
    e) Rail fence – row & Column Transformation
2. Implement the following algorithms
    a) DES
    b) RSA Algorithm
    c) Diffiee-Hellman
    d) MD5
    e) SHA-1
3. Implement the Signature Scheme - Digital Signature Standard
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)
5. Network Security and Analysis using WireShark
6. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

OUTCOMES:

At the end of the course, the student should be able to:

- Implement the cipher techniques
- Develop the various security algorithms
- Use different open source tools for network security and analysis

LIST OF HARDWARE REQUIREMENTS & SOFTWARE REQUIREMENTS

SOFTWARE REQUIREMENTS

- C or C++ or Java
- Java or equivalent compiler GnuPG
- WireShark
- Snort

HARDWARE REQUIREMENTS

- Standalone desktops (or) Server supporting 30 terminals or more

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IMPLEMENTATION OF CAESAR CIPHER

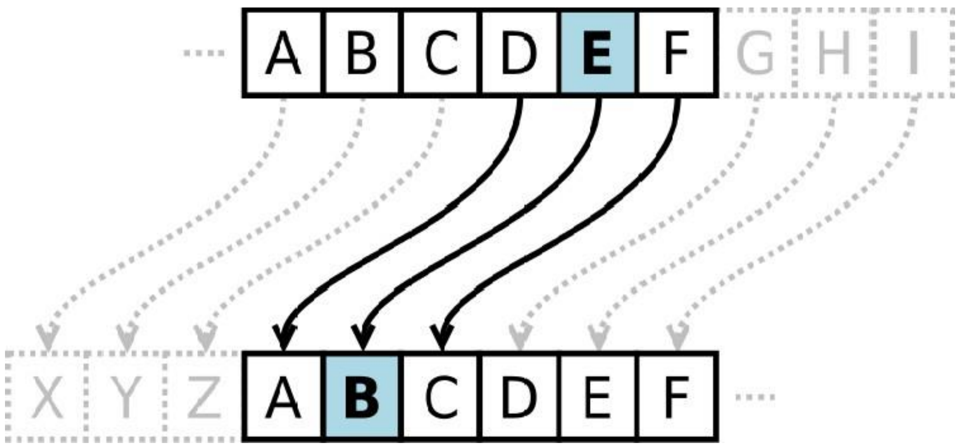
AIM:

To implement the simple substitution technique named Caesar cipher using C language.

DESCRIPTION:

To encrypt a message with a Caesar cipher, each letter in the message is changed using a simple rule: shift by three. Each letter is replaced by the letter three letters ahead in the alphabet. A becomes D, B becomes E, and so on. For the last letters, we can think of the alphabet as a circle and "wrap around". W becomes Z, X becomes A, Y becomes B, and Z becomes C. To change a message back, each letter is replaced by the one three before it.

EXAMPLE:



ALGORITHM:

STEP-1: Read the plain text from the user.

STEP-2: Read the key value from the user.

STEP-3: If the key is positive then encrypt the text by adding the key with each character in the plain text.

STEP-4: Else subtract the key from the plain text.

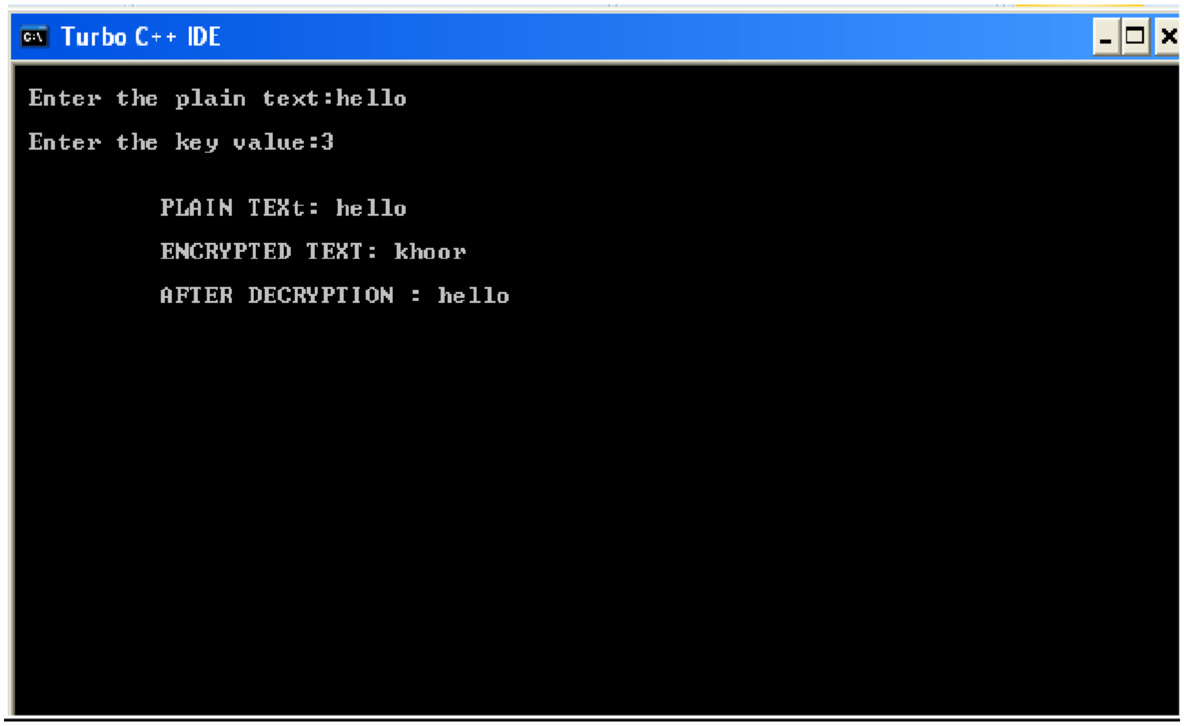
STEP-5: Display the cipher text obtained above.

PROGRAM: (Caesar Cipher)

```
#include <stdio.h>
#include <string.h>
#include<conio.h>
#include <ctype.h>
void main()
```

```
{
 char plain[10], cipher[10];
 int key,i,length;
 int result;
 clrscr();
 printf("\n Enter the plain text:");
 scanf("%s", plain);
 printf("\n Enter the key value:");
 scanf("%d", &key);
 printf("\n \n \t PLAIN TEXt: %s",plain);
 printf("\n \n \t ENCRYPTED TEXT: ");
 for(i = 0, length = strlen(plain); i < length; i++)
     {
     cipher[i]=plain[i] + key;
     if (isupper(plain[i]) && (cipher[i] > 'Z'))
     cipher[i] = cipher[i] - 26;
     if (islower(plain[i]) && (cipher[i] > 'z'))
     cipher[i] = cipher[i] - 26;
     printf("%c", cipher[i]);
     }
     printf("\n \n \t AFTER DECRYPTION : ");
 for(i=0;i<length;i++)
     {
      plain[i]=cipher[i]-key;
     if(isupper(cipher[i])&&(plain[i]<'A'))
     plain[i]=plain[i]+26;
     if(islower(cipher[i])&&(plain[i]<'a'))
     plain[i]=plain[i]+26;
     printf("%c",plain[i]);
 }
getch();
}
```

OUTPUT:



```
Enter the plain text:hello
Enter the key value:3

         PLAIN TEXt: hello
         ENCRYPTED TEXT: khoor
         AFTER DECRYPTION : hello
```

RESULT:

Thus the implementation of Caesar cipher had been executed successfully.

IMPLEMENTATION OF PLAYFAIR CIPHER

AIM:

To write a C program to implement the Playfair Substitution technique.

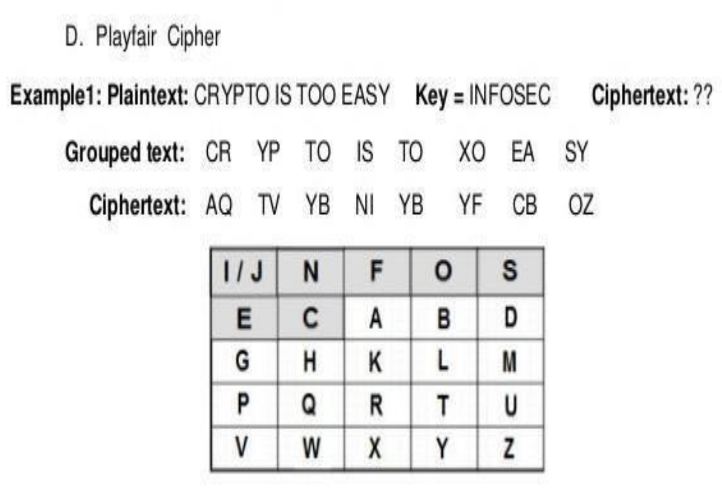
DESCRIPTION:

The Playfair cipher starts with creating a key table. The key table is a 5×5 grid of letters that will act as the key for encrypting your plaintext. Each of the 25 letters must be unique and one letter of the alphabet is omitted from the table (as there are 25 spots and 26 letters in the alphabet).

To encrypt a message, one would break the message into digrams (groups of 2 letters) such that, for example, "HelloWorld" becomes "HE LL OW OR LD", and map them out on the key table. The two letters of the diagram are considered as the opposite corners of a rectangle in the key table. Note the relative position of the corners of this rectangle. Thenapply the following 4 rules, in order, to each pair of letters in the plaintext:

1. If both letters are the same (or only one letter is left), add an "X" after the first letter
2. If the letters appear on the same row of your table, replace them with the letters to their immediate right respectively
3. If the letters appear on the same column of your table, replace them with the letters immediately below respectively
4. If the letters are not on the same row or column, replace them with the letters on the same row respectively but at the other pair of corners of the rectangle defined by the original pair.

EXAMPLE:



D. Playfair Cipher

Example1: Plaintext: CRYPTO IS TOO EASY **Key =** INFOSEC **Ciphertext:** ??

Grouped text: CR YP TO IS TO XO EA SY

Ciphertext: AQ TV YB NI YB YF CB OZ

I / J	N	F	O	S
E	C	A	B	D
G	H	K	L	M
P	Q	R	T	U
V	W	X	Y	Z

ALGORITHM:

STEP-1: Read the plain text from the user.

STEP-2: Read the keyword from the user.

STEP-3: Arrange the keyword without duplicates in a 5*5 matrix in the row order and fill the remaining cells with missed out letters in alphabetical order. Note that 'i' and 'j' takes the same cell.

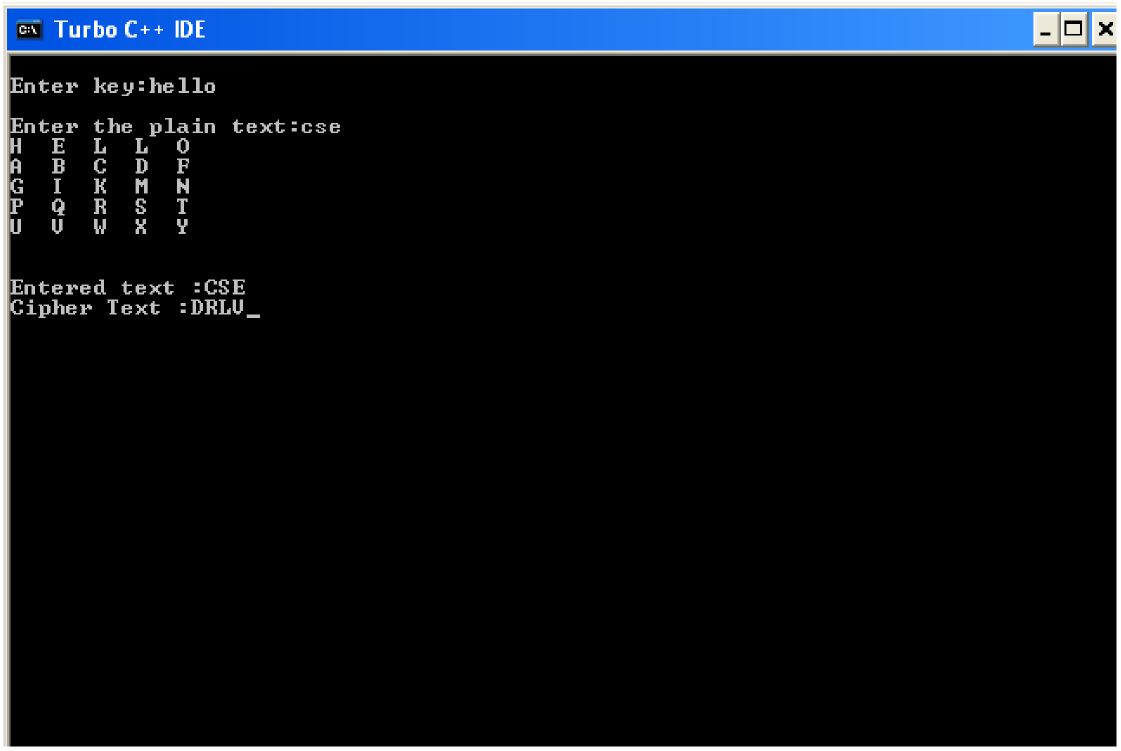
STEP-4: Group the plain text in pairs and match the corresponding corner letters by forming a rectangular grid.

STEP-5: Display the obtained cipher text.

PROGRAM: (Playfair Cipher)

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
#include<ctype.h>
#define MX 5
void playfair(char ch1,char ch2, char key[MX][MX])
{
     int i,j,w,x,y,z;
     FILE *out;
if((out=fopen("cipher.txt","a+"))==NULL)
{
     printf("File Currupted.");
}
for(i=0;i<MX;i++)
{
     for(j=0;j<MX;j++)
     {
     if(ch1==key[i][j])
     {
     w=i;
     x=j;
     }
     else if(ch2==key[i][j])
     {
     y=i;
     z=j;
}}}

//printf("%d%d %d%d",w,x,y,z);
if(w==y)
{
     x=(x+1)%5;z=(z+1)%5;
     printf("%c%c",key[w][x],key[y][z]);
     fprintf(out, "%c%c",key[w][x],key[y][z]);
}
else if(x==z)
{
     w=(w+1)%5;y=(y+1)%5;
     printf("%c%c",key[w][x],key[y][z]);
     fprintf(out, "%c%c",key[w][x],key[y][z]);
 }
 else
 {
     printf("%c%c",key[w][z],key[y][x]);
     fprintf(out, "%c%c",key[w][z],key[y][x]);
 }

fclose(out);
}
void main()
{
     int i,j,k=0,l,m=0,n;
     char   key[MX][MX],keyminus[25],keystr[10],str[25]={0};
     char
     alpa[26]={'A','B','C','D','E','F','G','H','I','J','K','L'
     ,'M','N','O','P','Q','R','S','T','U','V','W','X','Y','Z'}
     ;
     clrscr();
     printf("\nEnter key:");
     gets(keystr);
     printf("\nEnter the plain text:");
     gets(str);
     n=strlen(keystr);
     //convert the characters to uppertext
     for (i=0; i<n; i++)
     {
          if(keystr[i]=='j')keystr[i]='i';
          else if(keystr[i]=='J')keystr[i]='I';
          keystr[i] = toupper(keystr[i]);
     }
     //convert all the characters of plaintext to uppertext
     for (i=0; i<strlen(str); i++)
     {
          if(str[i]=='j')str[i]='i';
          else if(str[i]=='J')str[i]='I';
          str[i] = toupper(str[i]);
     }
     j=0;

     for(i=0;i<26;i++)
     {
          for(k=0;k<n;k++)
          {
          if(keystr[k]==alpa[i])
          break;
          else if(alpa[i]=='J')
          break;
          }
          if(k==n)
          {
          keyminus[j]=alpa[i];j++;
          }
     }
     //construct key keymatrix
     k=0;
     for(i=0;i<MX;i++)
     {
          for(j=0;j<MX;j++)
          {
          if(k<n)
          {
          key[i][j]=keystr[k];
          k++;}
          else
          {
          key[i][j]=keyminus[m];m++;
          }
          printf("%c  ",key[i][j]);
          }
          printf("\n");
     }
     printf("\n\nEntered text :%s\nCipher Text :",str);
     for(i=0;i<strlen(str);i++)
     {
     if(str[i]=='J')str[i]='I';
     if(str[i+1]=='\0')
     playfair(str[i],'X',key);
     else
     {
          if(str[i+1]=='J')str[i+1]='I';
          if(str[i]==str[i+1])
          playfair(str[i],'X',key);
          else
          {
          playfair(str[i],str[i+1],key);i++;
          }}
     }
getch();
}
```

OUTPUT:



```
Enter key:hello

Enter the plain text:cse
H   E   L   L   O
A   B   C   D   F
G   I   K   M   N
P   Q   R   S   T
U   V   W   X   Y


Entered text :CSE
Cipher Text :DRLV_
```

RESULT:

Thus the Playfair cipher substitution technique had been implemented successfully.

IMPLEMENTATION OF HILL CIPHER

AIM:

To write a C program to implement the hill cipher substitution techniques.

DESCRIPTION:

Each letter is represented by a number modulo 26. Often the simple scheme A = 0, B = 1... Z = 25, is used, but this is not an essential feature of the cipher. To encrypt a message, each block of *n* letters is multiplied by an invertible *n* × *n* matrix, against modulus 26. To decrypt the message, each block is multiplied by the inverse of the m atrix used for encryption. The matrix used for encryption is the cipher key, and it should be chosen randomly from the set of invertible *n* × *n* matrices (modulo 26).

EXAMPLE:

$$\begin{bmatrix} 2 & 4 & 5 \\ 9 & 2 & 1 \\ 3 & 17 & 7 \end{bmatrix} \begin{bmatrix} 0 \\ 19 \\ 19 \end{bmatrix}$$

$$= \begin{bmatrix} 171 \\ 57 \\ 456 \end{bmatrix} \pmod{26} = \begin{bmatrix} 15 \\ 5 \\ 14 \end{bmatrix} = \text{'PFO'}$$

ALGORITHM:

STEP-1: Read the plain text and key from the user.

STEP-2: Split the plain text into groups of length three.

STEP-3: Arrange the keyword in a 3*3 matrix.

STEP-4: Multiply the two matrices to obtain the cipher text of length three.

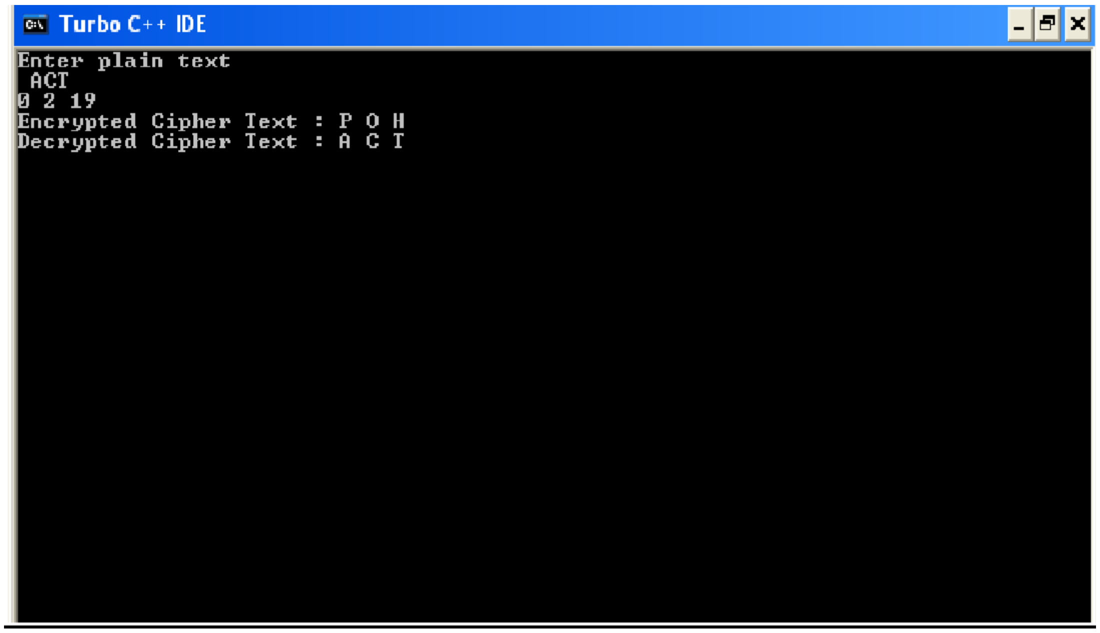
STEP-5: Combine all these groups to get the complete cipher text.

PROGRAM: (Hill Cipher)

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
int main(){
     unsigned int a[3][3]={{6,24,1},{13,16,10},{20,17,15}};
     unsigned int b[3][3]={{8,5,10},{21,8,21},{21,12,8}};
     int i,j, t=0;
     unsigned int c[20],d[20];
     char msg[20];
     clrscr();
     printf("Enter plain text\n ");
     scanf("%s",msg);
     for(i=0;i<strlen(msg);i++)
     {    c[i]=msg[i]-65;
     printf("%d ",c[i]);
     }
     for(i=0;i<3;i++)
     {    t=0;
     for(j=0;j<3;j++)
     {
          t=t+(a[i][j]*c[j]);
     }
          d[i]=t%26;
     }
printf("\nEncrypted Cipher Text :");
for(i=0;i<3;i++)
printf(" %c",d[i]+65);
for(i=0;i<3;i++)
{
     t=0;
     for(j=0;j<3;j++)
     {
          t=t+(b[i][j]*d[j]);
```

```
        }
        c[i]=t%26;
}
printf("\nDecrypted Cipher Text :");
for(i=0;i<3;i++)
printf(" %c",c[i]+65);
getch();
return 0;
}
```

OUTPUT:



```
Enter plain text
 ACT
0 2 19
Encrypted Cipher Text : P O H
Decrypted Cipher Text : A C T
```

RESULT:

Thus the hill cipher substitution technique had been implemented successfully in C.

IMPLEME TATION OF VIGENERE CIPHER

AIM:

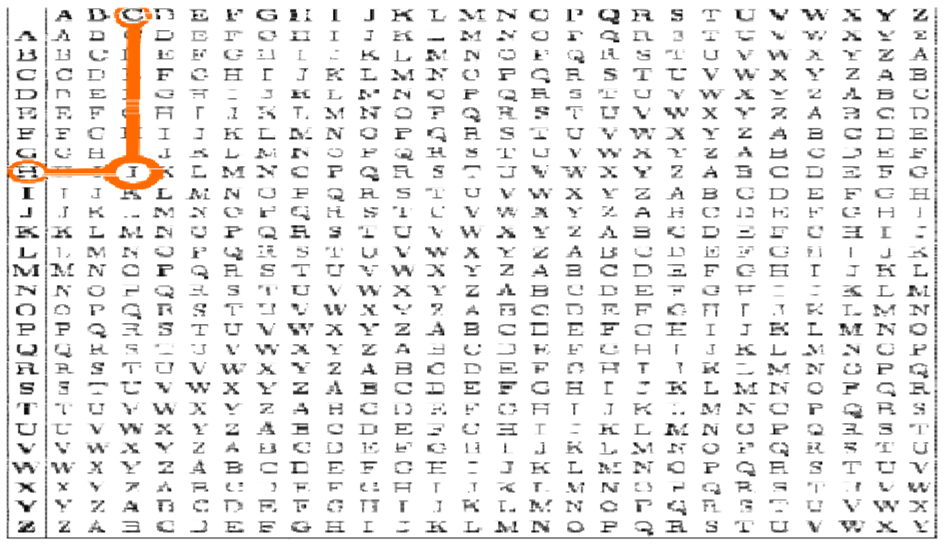
To implement the Vigenere Cipher substitution technique using C program.

DESCRIPTION:

To encrypt, a table of alphabets can be used, termed a tabula recta, Vigenère square, or Vigenère table. It consists of the alphabet written out 26 times in differ nt rows, each alphabet shifted cyclically to the left compared to the previous alphabet, corresponding to the 26 possible Caesar ciphers. At different points in the encryption process, the cipher uses a different alphabet from one of the rows. The alphabet used at each point depends on a repeating keyword.

Each row starts with a key letter. The remainder of the row holds the letters A to Z. Although there are 26 key rows shown, you will only use as many keys as there are unique letters in the key string, here just 5 keys, {L, E, M, O, N}. For successive letters of themessage, we are going to take successive letters of the key string, and encipher each message letter using its corresponding key row. Choose the next letter of the key, go al ng that row to find the column heading that matches the message character; the letter at the intersection of [key-row, msg-col] is the enciphered letter.

EXAMPLE:



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
B	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A
C	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B
D	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C
E	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D
F	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E
G	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F
H	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G
I	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H
J	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I
K	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J
L	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K
M	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L
N	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M
O	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N
P	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Q	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
R	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
S	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
T	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
U	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
V	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
W	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
X	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
Y	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Z	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y

ALGORITHM:

STEP-1: Arrange the alphabets in row and column of a 26*26 matrix.

STEP-2: Circulate the alphabets in each row to position left such that the first letter is attached to last.

STEP-3: Repeat this process for all 26 rows and construct the final key matrix.

STEP-4: The keyword and the plain text is read from the user.

STEP-5: The characters in the keyword are repeated sequentially so as to match with that of the plain text.

STEP-6: Pick the first letter of the plain text and that of the keyword as the row indices and column indices respectively.

STEP-7: The junction character where these two meet forms the cipher character.

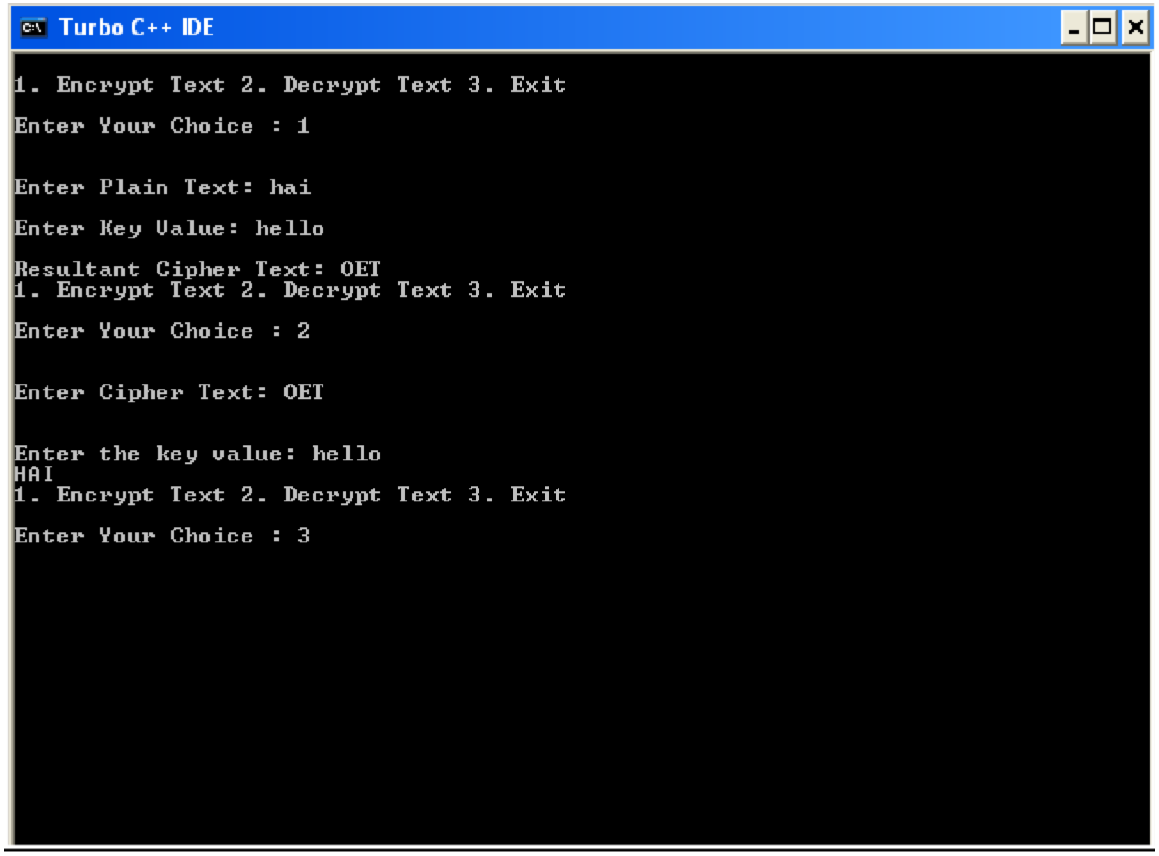
STEP-8: Repeat the above steps to generate the entire cipher text.

PROGRAM: (Vigenere Cipher)

```
#include <stdio.h>
#include<conio.h>
#include <ctype.h>
#include <string.h>
void encipher();
void decipher();
void main()
{
	int choice;
	clrscr();
	while(1)
	{
		printf("\n1. Encrypt Text");
		printf("\t2. Decrypt Text");
		printf("\t3. Exit");
		printf("\n\nEnter Your Choice : ");
		scanf("%d",&choice);
		if(choice == 3)
		exit(0);
		else if(choice == 1)
		encipher();
		else if(choice == 2)
		decipher();
		else
		printf("Please Enter Valid Option.");
	}
}
void encipher()
{
	unsigned int i,j;
	char input[50],key[10];
	printf("\n\nEnter Plain Text: ");
```

```
     scanf("%s",input);
     printf("\nEnter Key Value: ");
     scanf("%s",key);
     printf("\nResultant Cipher Text: ");
     for(i=0,j=0;i<strlen(input);i++,j++)
     {
          if(j>=strlen(key))
               {     j=0;
               }
     printf("%c",65+(((toupper(input[i])-65)+(toupper(key[j])-
     65))%26));
     }}
void decipher()
{
     unsigned int i,j;
     char input[50],key[10];
     int value;
     printf("\n\nEnter Cipher Text: ");
     scanf("%s",input);
     printf("\n\nEnter the key value: ");
     scanf("%s",key);
for(i=0,j=0;i<strlen(input);i++,j++)
{
     if(j>=strlen(key))
     {     j=0;       }
     value = (toupper(input[i])-64)-(toupper(key[j])-64);
     if( value < 0)
     {  value = value * -1;
     }
     printf("%c",65 + (value % 26));
}}
```

OUTPUT:



```
1. Encrypt Text 2. Decrypt Text 3. Exit

Enter Your Choice : 1


Enter Plain Text: hai

Enter Key Value: hello

Resultant Cipher Text: OET
1. Encrypt Text 2. Decrypt Text 3. Exit

Enter Your Choice : 2


Enter Cipher Text: OEI


Enter the key value: hello
HAI
1. Encrypt Text 2. Decrypt Text 3. Exit

Enter Your Choice : 3
```

RESULT:

Thus the Vigenere Cipher substitution technique had been implemented successfully.

IMPLEMENTATION OF RAIL FENCE – ROW & COLUMN TRANSFORMATION TECHNIQUE

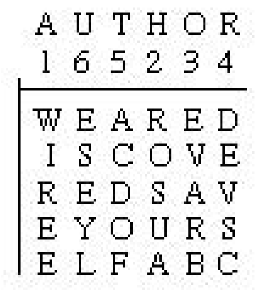
AIM:

To write a C program to implement the rail fence transposition technique.

DESCRIPTION:

In the rail fence cipher, the plain text is written downwards and diagonally on successive "rails" of an imaginary fence, then moving up when we reach the bottom rail.When we reach the top rail, the message is written downwards again until the whole plaintextis written out. The message is then read off in rows.

EXAMPLE:



A	U	T	H	O	R
1	6	5	2	3	4
W	E	A	R	E	D
I	S	C	O	V	E
R	E	D	S	A	V
E	Y	O	U	R	S
E	L	F	A	B	C

yields the cipher

W I R E E R O S U A E V A R B D E V S C A C D O F E S E Y L .

ALGORITHM:

STEP-1: Read the Plain text.

STEP-2: Arrange the plain text in row columnar matrix format.

STEP-3: Now read the keyword depending on the number of columns of the plain text.

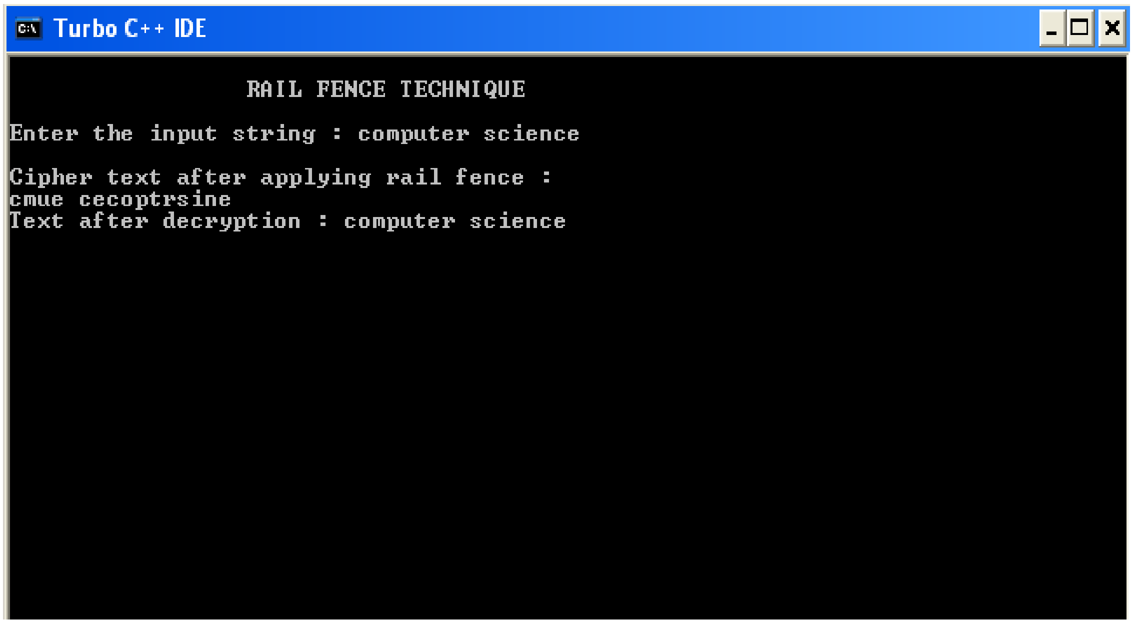
STEP-4: Arrange the characters of the keyword in sorted order and the corresponding columns of the plain text.

STEP-5: Read the characters row wise or column wise in the former order to get the cipher text.

PROGRAM: (Rail Fence)

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
void main()
{
     int i,j,k,l;
     char a[20],c[20],d[20];
     clrscr();
     printf("\n\t\t RAIL FENCE TECHNIQUE");
     printf("\n\nEnter the input string : ");
     gets(a);
     l=strlen(a);

/*Ciphering*/
for(i=0,j=0;i<l;i++)
{
     if(i%2==0)
     c[j++]=a[i];
}
for(i=0;i<l;i++)
{
     if(i%2==1)
     c[j++]=a[i];
}
c[j]='\0';
printf("\nCipher text after applying rail fence :");
printf("\n%s",c);

/*Deciphering*/
if(l%2==0)
     k=l/2;
else
     k=(l/2)+1;
for(i=0,j=0;i<k;i++)
{
    d[j]=c[i];
    j=j+2;
}
for(i=k,j=1;i<l;i++)
{
    d[j]=c[i];
    j=j+2;
}
d[l]='\0';
printf("\nText after decryption : ");
printf("%s",d);
getch();
}
```

OUTPUT:



Turbo C++ IDE

```
                 RAIL FENCE TECHNIQUE

Enter the input string : computer science

Cipher text after applying rail fence :
cmue cecoptrsine
Text after decryption : computer science
```

RESULT:

Thus the rail fence algorithm had been executed successfully.

IMPLEMENTATION OF DES

AIM:

To write a C program to implement Data Encryption Standard (DES) using C Language.

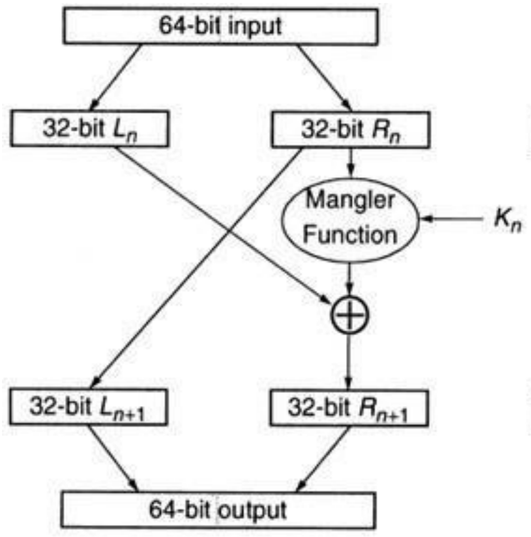
DESCRIPTION:

DES is a symmetric encryption system that uses 64-bit blocks, 8 bits of which areused for parity checks. The key therefore has a "useful" length of 56 bits, which means thatonly 56 bits are actually used in the algorithm. The algorithm involves carrying out combinations, substitutions and permutations between the text to be encrypted and the key, while making sure the operations can be performed in both directions. The key is ciphered on64 bits and made of 16 blocks of 4 bits, generally denoted k_1 to k_{16}. Given that "only" 56 bits are actually used for encrypting, there can be 2^{56} different keys.

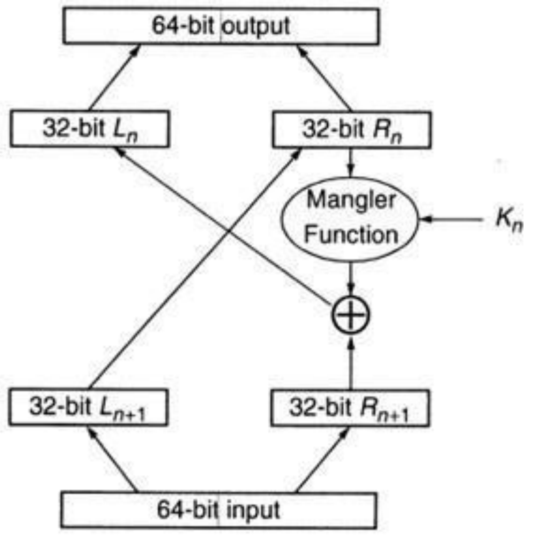
The main parts of the algorithm are as follows:

- ➢ Fractioning of the text into 64-bit blocks
- ➢ Initial permutation of blocks
- ➢ Breakdown of the blocks into two parts: left and right, named L and R
- ➢ Permutation and substitution steps repeated 16 times
- ➢ Re-joining of the left and right parts then inverse initial permutation

EXAMPLE:



Encryption



Decryption

ALGORITHM:

STEP-1: Read the 64-bit plain text.

STEP-2: Split it into two 32-bit blocks and store it in two different arrays.

STEP-3: Perform XOR operation between these two arrays.

STEP-4: The output obtained is stored as the second 32-bit sequence and the original second 32-bit sequence forms the first part.

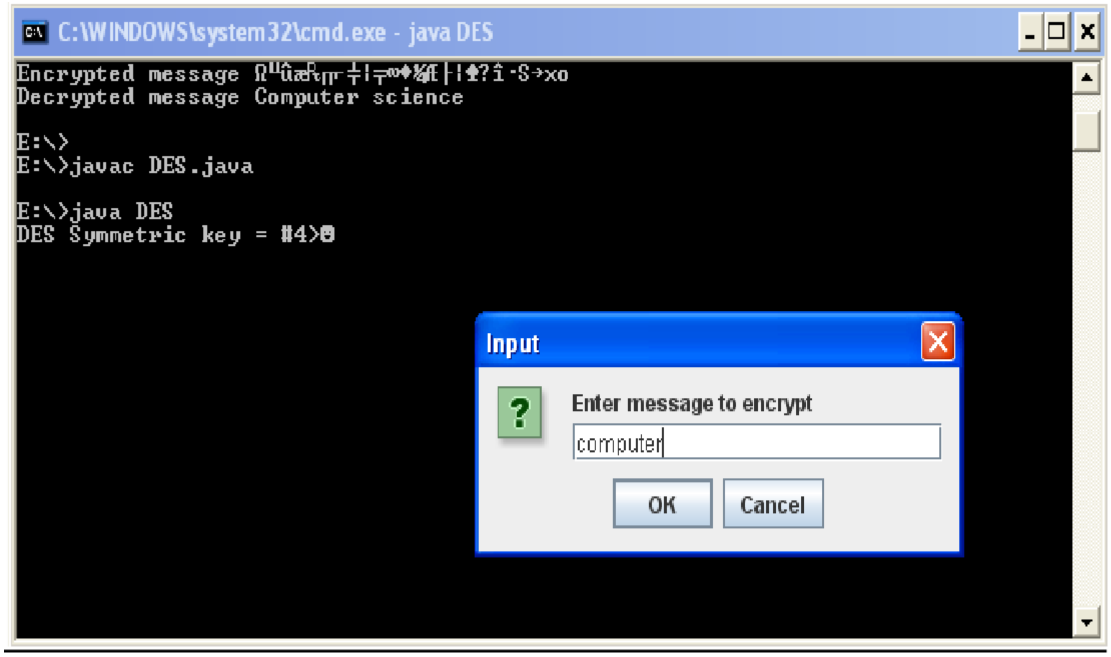
STEP-5: Thus the encrypted 64-bit cipher text is obtained in this way. Repeat the same process for the remaining plain text characters.

PROGRAM:

DES.java

```
import javax.swing.*;
import java.security.SecureRandom;
import javax.crypto.Cipher;
import javax.crypto.KeyGenerator;
import javax.crypto.SecretKey;
import javax.crypto.spec.SecretKeySpec;
import java.util.Random ;
class DES {
     byte[] skey = new byte[1000];
     String skeyString;
     static byte[] raw;
     String inputMessage,encryptedData,decryptedMessage;
public DES()
{
try
{
     generateSymmetricKey();
     inputMessage=JOptionPane.showInputDialog(null,"Enter
     message to encrypt");
     byte[] ibyte = inputMessage.getBytes();
     byte[] ebyte=encrypt(raw, ibyte);
     String encryptedData = new String(ebyte);
     System.out.println("Encrypted message "+encryptedData);
     JOptionPane.showMessageDialog(null,"Encrypted Data
     "+"\n"+encryptedData);
     byte[] dbyte= decrypt(raw,ebyte);
     String decryptedMessage = new String(dbyte);
     System.out.println("Decrypted message
     "+decryptedMessage);
     JOptionPane.showMessageDialog(null,"Decrypted Data
     "+"\n"+decryptedMessage);
}
catch(Exception e)
{
     System.out.println(e);
}
}
void generateSymmetricKey() {
try {
     Random r = new Random();
     int num = r.nextInt(10000);
     String knum = String.valueOf(num);
     byte[] knumb = knum.getBytes();
     skey=getRawKey(knumb);
     skeyString = new String(skey);
     System.out.println("DES Symmetric key = "+skeyString);
}
catch(Exception e)
{
     System.out.println(e);
}
}
private static byte[] getRawKey(byte[] seed) throws Exception
{
     KeyGenerator kgen = KeyGenerator.getInstance("DES");
     SecureRandom sr = SecureRandom.getInstance("SHA1PRNG");
     sr.setSeed(seed);
     kgen.init(56, sr);
     SecretKey skey = kgen.generateKey();
     raw = skey.getEncoded();
     return raw;
}
private static byte[] encrypt(byte[] raw, byte[] clear) throws
Exception {
          SecretKeySpec skeySpec = new SecretKeySpec(raw,
          "DES");
          Cipher cipher = Cipher.getInstance("DES");
          cipher.init(Cipher.ENCRYPT_MODE, skeySpec);
          byte[] encrypted = cipher.doFinal(clear);
          return encrypted;
}
private static byte[] decrypt(byte[] raw, byte[] encrypted)
throws Exception
{
          SecretKeySpec skeySpec = new SecretKeySpec(raw,
          "DES");
          Cipher cipher = Cipher.getInstance("DES");
          cipher.init(Cipher.DECRYPT_MODE, skeySpec);
          byte[] decrypted = cipher.doFinal(encrypted);
          return decrypted;
}
public static void main(String args[]) {
     DES des = new DES();
}
}
```

OUTPUT:

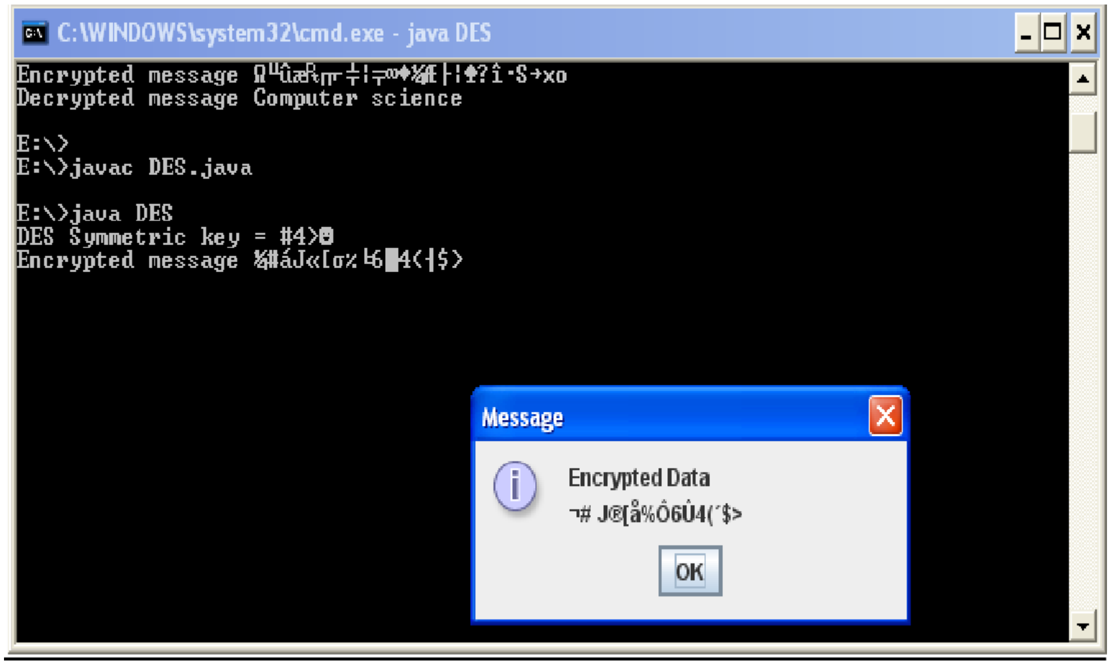


```
Encrypted message Ω╙ûæ₧╓╓┬╪¦╤∞♦¼Æ├¦♠?î·S→xo
Decrypted message Computer science

E:\>
E:\>javac DES.java

E:\>java DES
DES Symmetric key = ‼4>☻
```

Input

Enter message to encrypt

computer

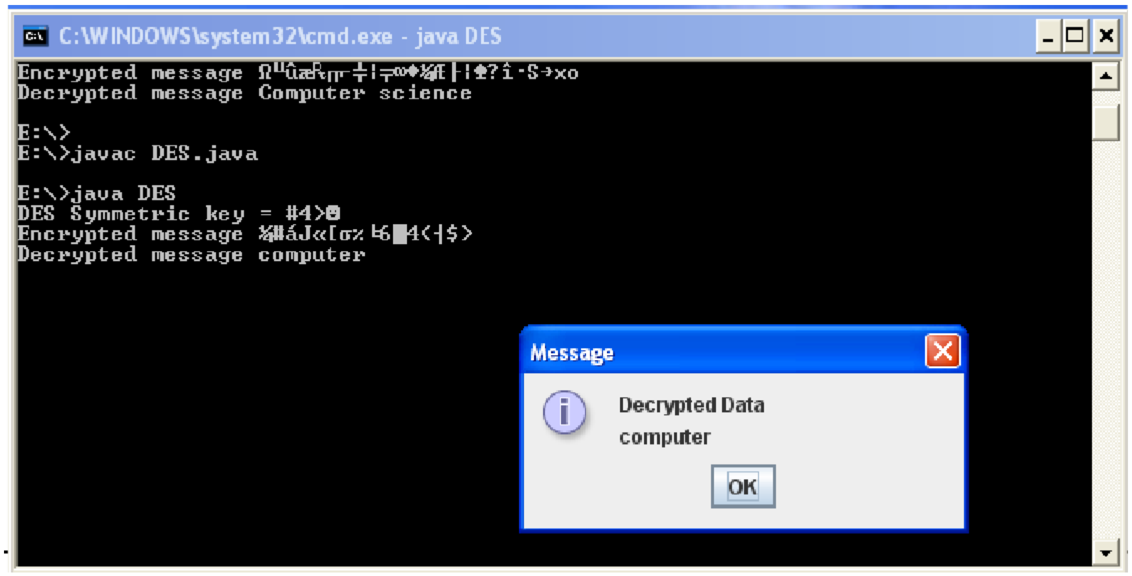


```
Encrypted message Ω╙ûæ₧╓╓┬╪¦╤∞♦¼Æ├¦♠?î·S→xo
Decrypted message Computer science

E:\>
E:\>javac DES.java

E:\>java DES
DES Symmetric key = ‼4>☻
Encrypted message ¼‼áJ«[σ%╘6█4(┤$>
```

Message

Encrypted Data

¬# J®[å%Ô6Û4(´$>



```
Encrypted message Ω╙ûæ₧╥╓┬╧¦╤∞♦¼£├¦♠?î·S→xo
Decrypted message Computer science

E:\>
E:\>javac DES.java

E:\>java DES
DES Symmetric key = #4>☻
Encrypted message ¼#áJ«[σ%╘6█4<┤$>
Decrypted message computer
```

Decrypted Data
computer

RESULT:

Thus the data encryption standard algorithm had been implemented successfully using C language.

IMPLEMENTATION OF RSA

AIM:

To write a C program to implement the RSA encryption algorithm.

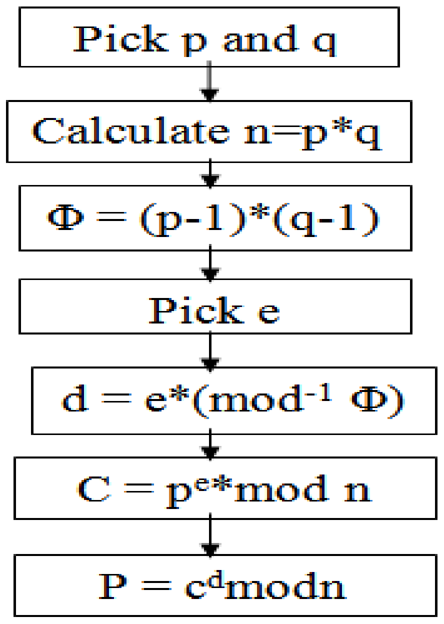
DESCRIPTION:

RSA is an algorithm used by modern computers to encrypt and decrypt messages. It is an asymmetric cryptographic algorithm. Asymmetric means that there are two different keys. This is also called public key cryptography, because one of them can be given toeveryone. A basic principle behind RSA is the observation that it is practical to find threevery large positive integers e, d and n such that with modular exponentiation for all integer m:

$$(m^e)^d = m \pmod n$$

The public key is represented by the integers n and e; and, the private key, by the integer d. m represents the message. RSA involves a public key and a private key. The public key can be known by everyone and is used for encrypting messages. The intention is that messages encrypted with the public key can only be decrypted in a reasonable amount oftime using the private key.

EXAMPLE:



ALGORITHM:

STEP-1: Select two co-prime numbers as p and q.

STEP-2: Compute n as the product of p and q.

STEP-3: Compute (p-1)*(q-1) and store it in z.

STEP-4: Select a random prime number e that is less than that of z.

STEP-5: Compute the private key, d as e * mod^{-1}(z).

STEP-6: The cipher text is computed as message^{e} * mod n.

STEP-7: Decryption is done as cipher^{d}mod n.

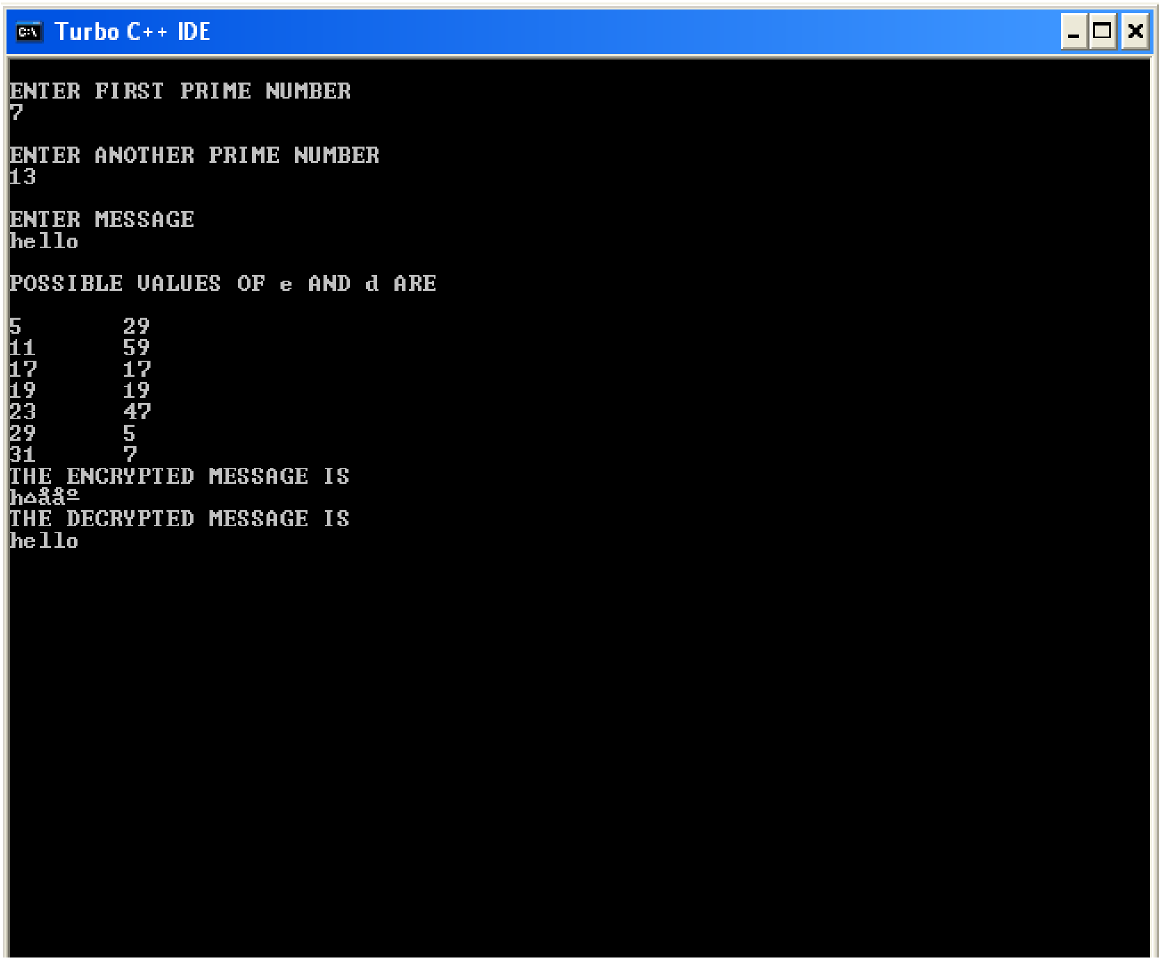
PROGRAM: (RSA)

```
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<math.h>
#include<string.h>
     long int
     p,q,n,t,flag,e[100],d[100],temp[100],j,m[100],en[100],i;
     char msg[100];
     int prime(long int);
     void ce();
     long int cd(long int);
     void encrypt();
     void decrypt();
void main()
{
     clrscr();
     printf("\nENTER FIRST PRIME NUMBER\n");
     scanf("%d",&p);
     flag=prime(p);
     if(flag==0)
      {
          printf("\nWRONG INPUT\n");
          getch();
      }
      printf("\nENTER ANOTHER PRIME NUMBER\n");
      scanf("%d",&q);
      flag=prime(q);
      if(flag==0||p==q)
      {
       printf("\nWRONG INPUT\n");
       getch();
      }
      printf("\nENTER MESSAGE\n");
      fflush(stdin);
      scanf("%s",msg);
      for(i=0;msg[i]!=NULL;i++)
      m[i]=msg[i];
      n=p*q;
```

```
        t=(p-1)*(q-1);
        ce();
        printf("\nPOSSIBLE VALUES OF e AND d ARE\n");
        for(i=0;i<j-1;i++)
        printf("\n%ld\t%ld",e[i],d[i]);
        encrypt();
        decrypt();
        getch();
}
int prime(long int pr)
{
int i;
j=sqrt(pr);
for(i=2;i<=j;i++)
{
if(pr%i==0)
return 0;
}
return 1;
}
void ce()
{
int k;
k=0;
for(i=2;i<t;i++)
{
 if(t%i==0)
 continue;
 flag=prime(i);
 if(flag==1&&i!=p&&i!=q)
 {
 e[k]=i;
 flag=cd(e[k]);
 if(flag>0)
 {
 d[k]=flag;
 k++;
 }
 if(k==99)
 break;
 } } }
 long int cd(long int x)
 {
 long int k=1;
 while(1)
 {
 k=k+t;
 if(k%x==0)
 return(k/x);
 } }
 void encrypt() {
 long int pt,ct,key=e[0],k,len;
 i=0;
 len=strlen(msg);
```

```
while(i!=len) {
pt=m[i];
pt=pt-96;
k=1;
for(j=0;j<key;j++)
{ k=k*pt;
k=k%n;
}
temp[i]=k;
ct=k+96;
en[i]=ct;
i++;
}
en[i]=-1;
printf("\nTHE ENCRYPTED MESSAGE IS\n");
for(i=0;en[i]!=-1;i++)
printf("%c",en[i]);
}
void decrypt()
{
long int pt,ct,key=d[0],k;
i=0;
while(en[i]!=-1)
{
ct=temp[i];
k=1;
for(j=0;j<key;j++)
{
k=k*ct;
k=k%n;
}
pt=k+96;
m[i]=pt;
i++;
}
m[i]=-1;
printf("\nTHE DECRYPTED MESSAGE IS\n");
for(i=0;m[i]!=-1;i++)
printf("%c",m[i]);
}
```

OUTPUT:



```
ENTER FIRST PRIME NUMBER
7

ENTER ANOTHER PRIME NUMBER
13

ENTER MESSAGE
hello

POSSIBLE VALUES OF e AND d ARE

5       29
11      59
17      17
19      19
23      47
29      5
31      7
THE ENCRYPTED MESSAGE IS
h⌂ååº
THE DECRYPTED MESSAGE IS
hello
```

RESULT:

Thus the C program to implement RSA encryption technique had been implemented successfully

IMPLEMENTATION OF DIFFIE HELLMAN KEY EXCHANGE ALGORITHM

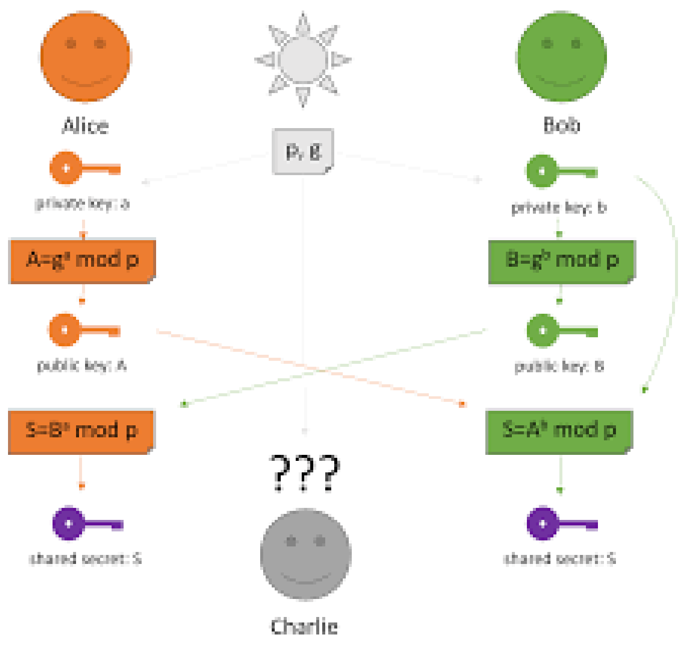
AIM:

To implement the Diffie-Hellman Key Exchange algorithm using C language.

DESCRIPTION:

Diffie–Hellman Key Exchange establishes a shared secret between two parties that can be used for secret communication for exchanging data over a public network. It is primarily used as a method of exchanging cryptography keys for use in symmetric encryption algorithms like AES. The algorithm in itself is very simple. The process begins by having the two parties, Alice and Bob. Let's assume that Alice wants to establish a shared secret with Bob.

EXAMPLE:



ALGORITHM:

STEP-1: Both Alice and Bob shares the same public keys g and p.

STEP-2: Alice selects a random public key a.

STEP-3: Alice computes his secret key A as g^a mod p.

STEP-4: Then Alice sends A to Bob.

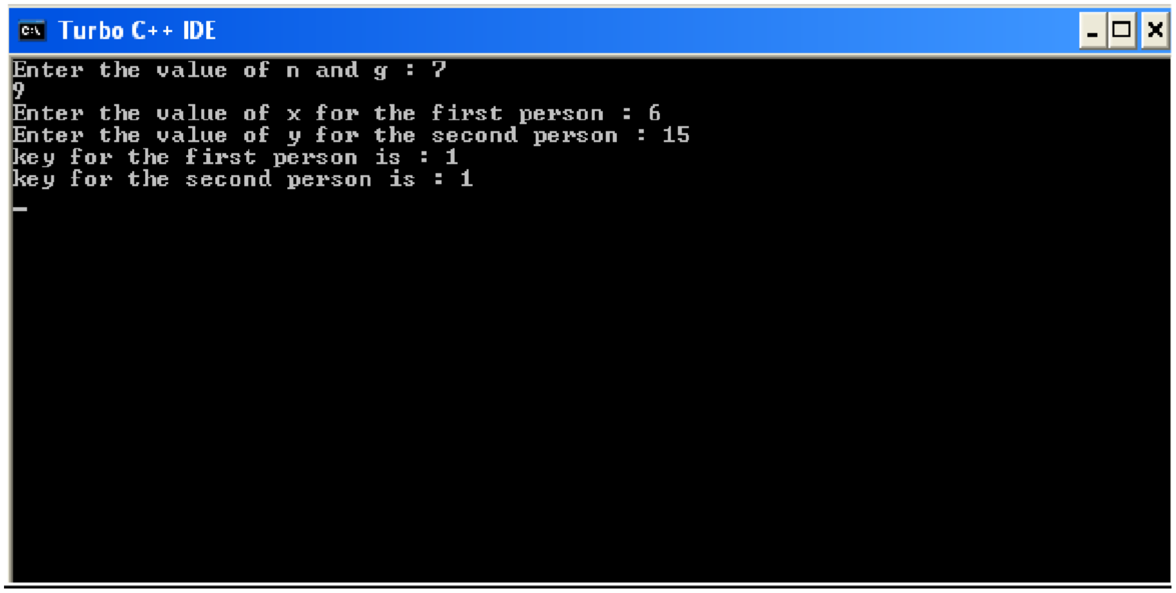
STEP-5: Similarly Bob also selects a public key b and computes his secret key as B and sends the same back to Alice.

STEP-6: Now both of them compute their common secret key as the other one's secret key power of a mod p.

<u>PROGRAM:</u> (Diffie Hellman Key Exchange)

```
#include<stdio.h>
#include<conio.h>
long long int power(int a, int b, int mod)
{
     long long int t;
     if(b==1)
     return a;
     t=power(a,b/2,mod);
     if(b%2==0)
     return (t*t)%mod;
     else
     return  (((t*t)%mod)*a)%mod;
}
long int calculateKey(int a, int x, int n)
{
     return power(a,x,n);
}
void main()
{
     int n,g,x,a,y,b;
     clrscr();
     printf("Enter the value of n and g : ");
     scanf("%d%d",&n,&g);
     printf("Enter the value of x for the first person : ");
     scanf("%d",&x);
     a=power(g,x,n);
     printf("Enter the value of y for the second person : ");
     scanf("%d",&y);
     b=power(g,y,n);
     printf("key for the first person is :
     %lld\n",power(b,x,n));
     printf("key for the second person is :
     %lld\n",power(a,y,n));
     getch();
}
```

OUTPUT:



```
Enter the value of n and g : 7
9
Enter the value of x for the first person : 6
Enter the value of y for the second person : 15
key for the first person is : 1
key for the second person is : 1
_
```

RESULT:

Thus the Diffie-Hellman key exchange algorithm had been successfully implemented using C.

IMPLEMENTATION OF MD5

AIM:

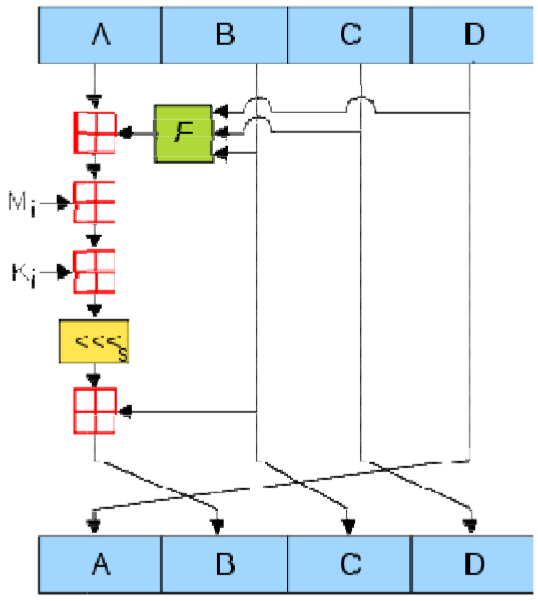
To write a C program to implement the MD5 hashing technique.

DESCRIPTION:

MD5 processes a variable-length message into a fixed-length output of 128 bits. The input message is broken up into chunks of 512-bit blocks. The message is pa ded so that its length is divisible by 512. The padding works as follows: first a single bit, 1, is appended to the end of the message. This is followed by as many zeros as are required to bring the lengthof the message up to 64 bits less than a multiple of 512. The remaining bits are filled up with 64 bits representing the length of the original message, modulo 2^{64}.The main MD5 algorithm

operates on a 128-bit state, divided into four 32-bit words, denoted A, B, C, and D. These are initialized to certain fixed constants. The main algorithm then uses each 512-bit message block in turn to modify the stat e.

EXAMPLE:



ALGORITHM:

STEP-1: Read the 128-bit plain text.

STEP-2: Divide into four blocks of 32-bits named as A, B, C and D.

STEP-3: Compute the functions f, g, h and i with operations such as, rotations, permutations, etc,.

STEP-4: The output of these functions are combined together as F and performed circular shifting and then given to key round.

STEP-5: Finally, right shift of ‘s’ times are performed and the results are combined together to produce the final output.

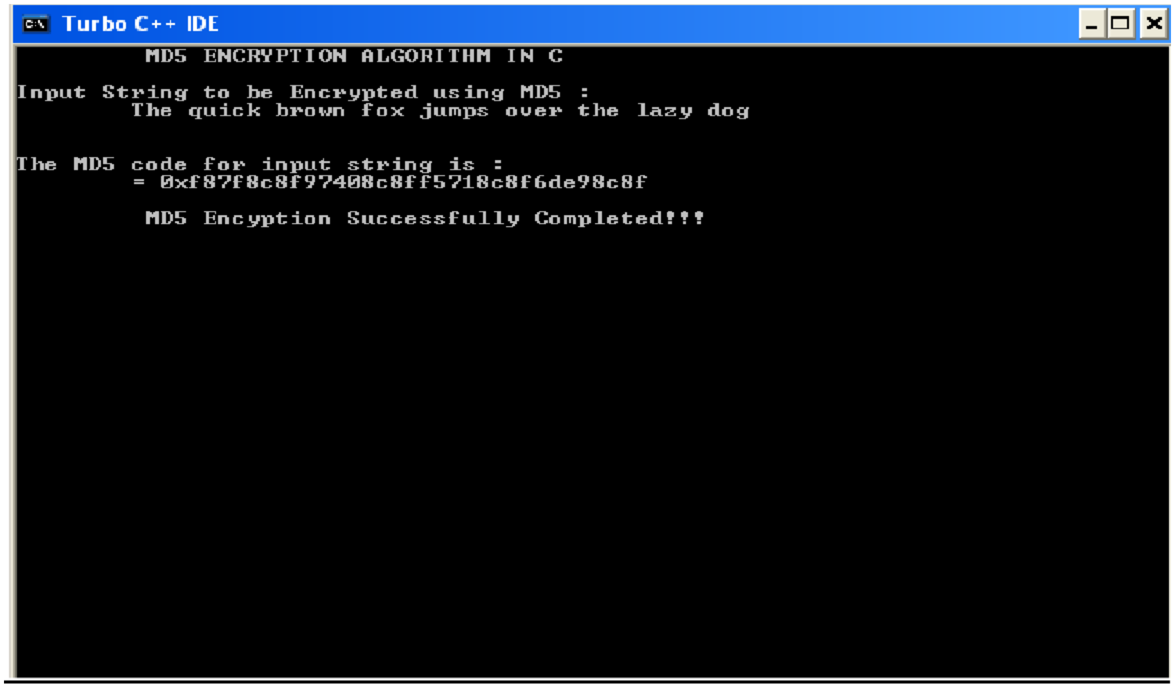
PROGRAM:(MD5)

```
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <math.h>
#include<conio.h>
typedef union uwb
{
    unsigned w;
    unsigned char b[4];
} MD5union;
     typedef unsigned DigestArray[4];
     unsigned func0( unsigned abcd[] ){
     return ( abcd[1] & abcd[2]) | (~abcd[1] & abcd[3]);}
     unsigned func1( unsigned abcd[] ){
     return ( abcd[3] & abcd[1]) | (~abcd[3] & abcd[2]);}
     unsigned func2( unsigned abcd[] ){
     return abcd[1] ^ abcd[2] ^ abcd[3];}
     unsigned func3( unsigned abcd[] ){
     return abcd[2] ^ (abcd[1] |~ abcd[3]);}
     typedef unsigned (*DgstFctn)(unsigned a[]);
unsigned *calctable( unsigned *k)
{
     double s, pwr;
     int i;
     pwr = pow( 2, 32);
for (i=0; i<64; i++)
{
     s = fabs(sin(1+i));
     k[i] = (unsigned)( s * pwr );
}
     return k;
}
unsigned rol( unsigned r, short N )
{
    unsigned  mask1 = (1<<N) -1;
    return ((r>>(32-N)) & mask1) | ((r<<N) & ~mask1);
}
```

```
unsigned *md5( const char *msg, int mlen)
{
    static DigestArray h0 = { 0x67452301, 0xEFCDAB89,
    0x98BADCFE, 0x10325476 };
    static DgstFctn ff[] = { &func0, &func1, &func2, &func3};
    static short M[] = { 1, 5, 3, 7 };
    static short O[] = { 0, 1, 5, 0 };
    static short rot0[] = { 7,12,17,22};
    static short rot1[] = { 5, 9,14,20};
    static short rot2[] = { 4,11,16,23};
    static short rot3[] = { 6,10,15,21};
    static short *rots[] = {rot0, rot1, rot2, rot3 };
    static unsigned kspace[64];
    static unsigned *k;
    static DigestArray h;
    DigestArray abcd;
    DgstFctn fctn;
    short m, o, g;
    unsigned f;
    short *rotn;
    union
    {
         unsigned w[16];
         char     b[64];
    }mm;
         int os = 0;
         int grp, grps, q, p;
         unsigned char *msg2;
         if (k==NULL) k= calctable(kspace);
    for (q=0; q<4; q++) h[q] = h0[q];   // initialize
    {
          grps = 1 + (mlen+8)/64;
          msg2 = malloc( 64*grps);
          memcpy( msg2, msg, mlen);
          msg2[mlen] = (unsigned char)0x80;
          q = mlen + 1;
     while (q < 64*grps){ msg2[q] = 0; q++ ; }
     {
          MD5union u;
          u.w = 8*mlen;
          q -= 8;
          memcpy(msg2+q, &u.w, 4 );
     }
     }
     for (grp=0; grp<grps; grp++)
     {
          memcpy( mm.b, msg2+os, 64);
```

```
       for(q=0;q<4;q++) abcd[q] = h[q];
       for (p = 0; p<4; p++)
       {
            fctn = ff[p];
            rotn = rots[p];
            m = M[p]; o= O[p];
       for (q=0; q<16; q++)
       {
           g = (m*q + o) % 16;
           f = abcd[1] + rol( abcd[0]+ fctn(abcd)+k[q+16*p]
           + mm.w[g], rotn[q%4]);
           abcd[0] = abcd[3];
           abcd[3] = abcd[2];
           abcd[2] = abcd[1];
          abcd[1] = f;
       }}
 for (p=0; p<4; p++)
 h[p] += abcd[p];
 os += 64;
 }
return h;}
void main()
{
     int j,k;
     const char *msg = "The quick brown fox jumps over
     the lazy dog";
     unsigned *d = md5(msg, strlen(msg));
     MD5union u;
     clrscr();
     printf("\t MD5 ENCRYPTION ALGORITHM IN C \n\n");
     printf("Input String to be Encrypted using MD5 :
     \n\t%s",msg);
     printf("\n\nThe MD5 code for input string is: \n");
     printf("\t= 0x");
     for (j=0;j<4; j++){
     u.w = d[j];
     for (k=0;k<4;k++) printf("%02x",u.b[k]);
}
printf("\n");
printf("\n\t MD5 Encyption Successfully
Completed!!!\n\n");
getch();
system("pause");
getch();}
```

OUTPUT:



```
          MD5 ENCRYPTION ALGORITHM IN C

Input String to be Encrypted using MD5 :
        The quick brown fox jumps over the lazy dog


The MD5 code for input string is :
        = 0xf87f8c8f97408c8ff5718c8f6de98c8f

          MD5 Encyption Successfully Completed!!!
```

RESULT:

Thus the implementation of MD5 hashing algorithm had been implemented successfully using C.

IMPLEMENTATION OF SHA-I

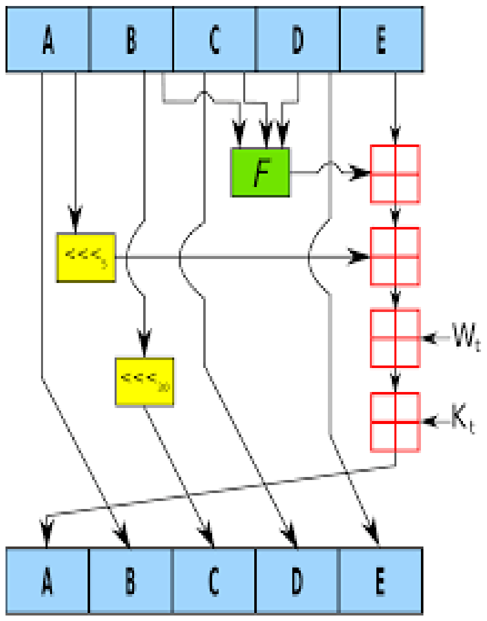
AIM:

To implement the SHA-I hashing technique using C program.

DESCRIPTION:

In cryptography, SHA-1 (Secure Hash Algorithm 1) is a cryptographic hash function. SHA-1 produces a 160-bit hash value known as a message digest. The waythis algorithm works is that for a message of size < 264 bits it computes a 160-bit condensed output called a message digest. The SHA-1 algorithm is designed so that it is practicallyinfeasible to find two input messages that hash to the same output message. A hash function such as SHA-1 is used to calculate an alphanumeric string that serves as the cryptographic representation of a file or a piece of data. This is called a digest and can serve as a digital signature. It is supposed to be unique and non-reversible.

EXAMPLE:



ALGORITHM:

STEP-1: Read the 256-bit key values.

STEP-2: Divide into five equal-sized blocks named A, B, C, D and E.

STEP-3: The blocks B, C and D are passed to the function F.

STEP-4: The resultant value is permuted with block E.

STEP-5: The block A is shifted right by ‘s’ times and permuted with the result of step-4.

STEP-6: Then it is permuted with a weight value and then with some other key pair and taken as the first block.

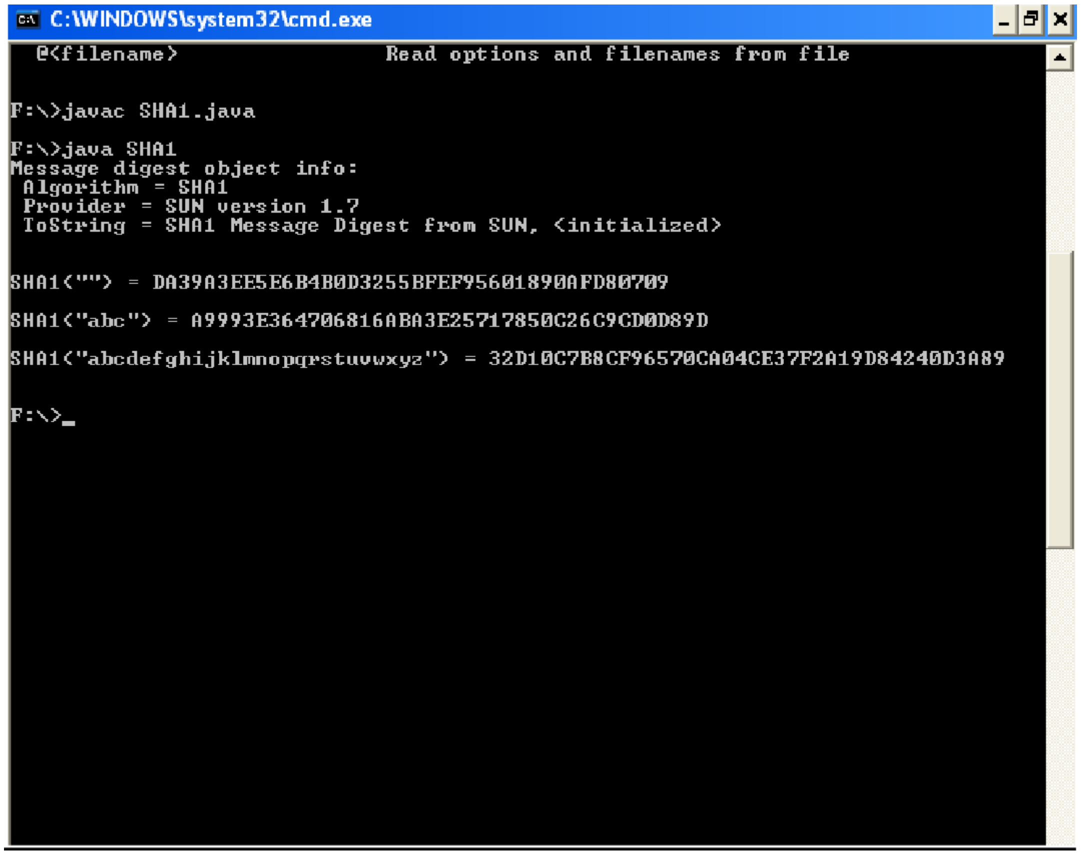
STEP-7: Block A is taken as the second block and the block B is shifted by ‘s’ times and taken as the third block.

STEP-8: The blocks C and D are taken as the block D and E for the final output.

PROGRAM: (Secure Hash Algorithm)

```
import java.security.*;
public class SHA1 {
     public static void main(String[] a) {
     try {
     MessageDigest md = MessageDigest.getInstance("SHA1");
     System.out.println("Message digest object info: ");
     System.out.println(" Algorithm = " +md.getAlgorithm());
     System.out.println(" Provider = " +md.getProvider());
     System.out.println(" ToString = " +md.toString());
     String input = "";
     md.update(input.getBytes());
     byte[] output = md.digest();
     System.out.println();
     System.out.println("SHA1(\""+input+"\")  =
     +bytesToHex(output));
     input = "abc";
     md.update(input.getBytes());
     output = md.digest();
     System.out.println();
     System.out.println("SHA1(\""+input+"\")  = "
     +bytesToHex(output));
     input = "abcdefghijklmnopqrstuvwxyz";
     md.update(input.getBytes());
     output = md.digest();
     System.out.println();
     System.out.println("SHA1(\"" +input+"\")  = "
     +bytesToHex(output));
     System.out.println(""); }
     catch (Exception e) {
     System.out.println("Exception: " +e);
}
}
public static String bytesToHex(byte[] b)
{
     char hexDigit[] = {'0', '1', '2', '3', '4', '5', '6',
     '7', '8', '9', 'A', 'B', 'C', 'D', 'E', 'F'};
     StringBuffer buf = new StringBuffer();
     for (int j=0; j<b.length; j++) {
     buf.append(hexDigit[(b[j] >> 4) & 0x0f]);
     buf.append(hexDigit[b[j] & 0x0f]); }
     return buf.toString(); }
}
```

OUTPUT:



```
  @<filename>                  Read options and filenames from file

F:\>javac SHA1.java

F:\>java SHA1
Message digest object info:
 Algorithm = SHA1
 Provider = SUN version 1.7
 ToString = SHA1 Message Digest from SUN, <initialized>

SHA1("") = DA39A3EE5E6B4B0D3255BFEF95601890AFD80709

SHA1("abc") = A9993E364706816ABA3E25717850C26C9CD0D89D

SHA1("abcdefghijklmnopqrstuvwxyz") = 32D10C7B8CF96570CA04CE37F2A19D84240D3A89

F:\>_
```

RESULT:

Thus the SHA-1 hashing technique had been implemented successfully.

IMPLEMENTATION OF DIGITAL SIGNATURE STANDARD

AIM:

To write a C program to implement the signature scheme named digital signature standard (Euclidean Algorithm).

ALGORITHM:

STEP-1: Alice and Bob are investigating a forgery case of x and y.

STEP-2: X had document signed by him but he says he did not sign that document digitally.

STEP-3: Alice reads the two prime numbers p and a.

STEP-4: He chooses a random co-primes alpha and beta and the x's original signature x.

STEP-5: With these values, he applies it to the elliptic curve cryptographic equation to obtain y.

STEP-6: Comparing this 'y' with actual y's document, Alice concludes that y is a forgery.

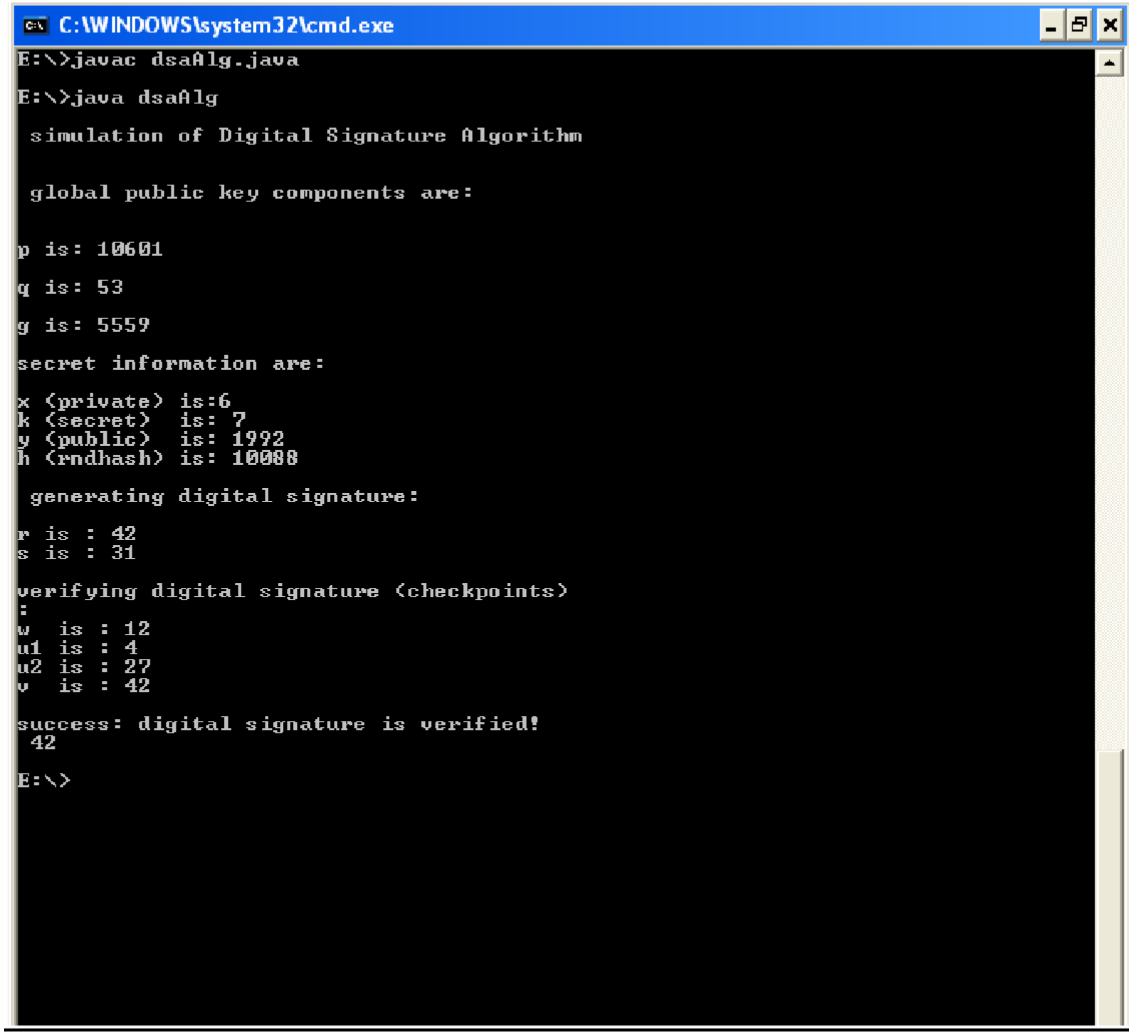
PROGRAM: (Digital Signature Standard)

```
import java.util.*;
import java.math.BigInteger;
class dsaAlg {
     final static BigInteger one = new BigInteger("1");
     final static BigInteger zero = new BigInteger("0");
public static BigInteger getNextPrime(String ans)
{
     BigInteger test = new BigInteger(ans);
while (!test.isProbablePrime(99))
e:
{
     test = test.add(one);
}
     return test;
}
public static BigInteger findQ(BigInteger n)
{
     BigInteger start = new BigInteger("2");
while (!n.isProbablePrime(99))
{
     while  (!((n.mod(start)).equals(zero)))
     {
          start = start.add(one);
```

```
            }
            n = n.divide(start);
        }
            return n;
        }
        public static BigInteger getGen(BigInteger p, BigInteger q,
        Random r)
        {
            BigInteger h = new BigInteger(p.bitLength(), r);
            h = h.mod(p);
            return h.modPow((p.subtract(one)).divide(q), p);
        }
        public static void main (String[] args) throws
        java.lang.Exception
        {
            Random randObj = new Random();
            BigInteger p = getNextPrime("10600"); /* approximate
            prime */
            BigInteger q = findQ(p.subtract(one));
            BigInteger g = getGen(p,q,randObj);
            System.out.println(" \n simulation of Digital Signature
            Algorithm \n");
            System.out.println(" \n global public key components
            are:\n");
            System.out.println("\np is: " + p);
            System.out.println("\nq is: " + q);
            System.out.println("\ng is: " + g);
            BigInteger x = new BigInteger(q.bitLength(), randObj);
            x = x.mod(q);
            BigInteger y = g.modPow(x,p);
            BigInteger k = new BigInteger(q.bitLength(), randObj);
            k = k.mod(q);
            BigInteger r = (g.modPow(k,p)).mod(q);
            BigInteger hashVal = new BigInteger(p.bitLength(),
            randObj);
            BigInteger kInv = k.modInverse(q);
            BigInteger s = kInv.multiply(hashVal.add(x.multiply(r)));
            s = s.mod(q);
            System.out.println("\nsecret information are:\n");
            System.out.println("x (private) is:" + x);
            System.out.println("k (secret) is: " + k);
            System.out.println("y (public) is: " + y);
            System.out.println("h (rndhash) is: " + hashVal);
            System.out.println("\n generating digital signature:\n");
            System.out.println("r is : " + r);
            System.out.println("s is : " + s);
            BigInteger w = s.modInverse(q);
            BigInteger u1 = (hashVal.multiply(w)).mod(q);
            BigInteger u2 = (r.multiply(w)).mod(q);
            BigInteger v = (g.modPow(u1,p)).multiply(y.modPow(u2,p));
            v = (v.mod(p)).mod(q);
            System.out.println("\nverifying digital signature
            (checkpoints)\n:");
            System.out.println("w  is : " + w);
```

```
      System.out.println("u1 is : " + u1);
      System.out.println("u2 is : " + u2);
      System.out.println("v is : " + v);
if (v.equals(r))
{
      System.out.println("\nsuccess: digital signature is
      verified!\n " + r);
}
else
{
      System.out.println("\n error: incorrect digital
      signature\n ");
}
}
}
```

OUTPUT:



```
E:\>javac dsaAlg.java

E:\>java dsaAlg

 simulation of Digital Signature Algorithm


 global public key components are:


p is: 10601

q is: 53

g is: 5559

secret information are:

x (private) is:6
k (secret)  is: 7
y (public)  is: 1992
h (rndhash) is: 10088

 generating digital signature:

r is : 42
s is : 31

verifying digital signature (checkpoints)
:
w  is : 12
u1 is : 4
u2 is : 27
v  is : 42

success: digital signature is verified!
 42

E:\>
```

RESULT:

Thus the simple Code Optimization techniques had been implemented successfully.

SECURE DATA STORAGE, SECURE DATA TRANSMISSION AND FOR CREATING DIGITAL SIGNATURES (GNUPG)

AIM:

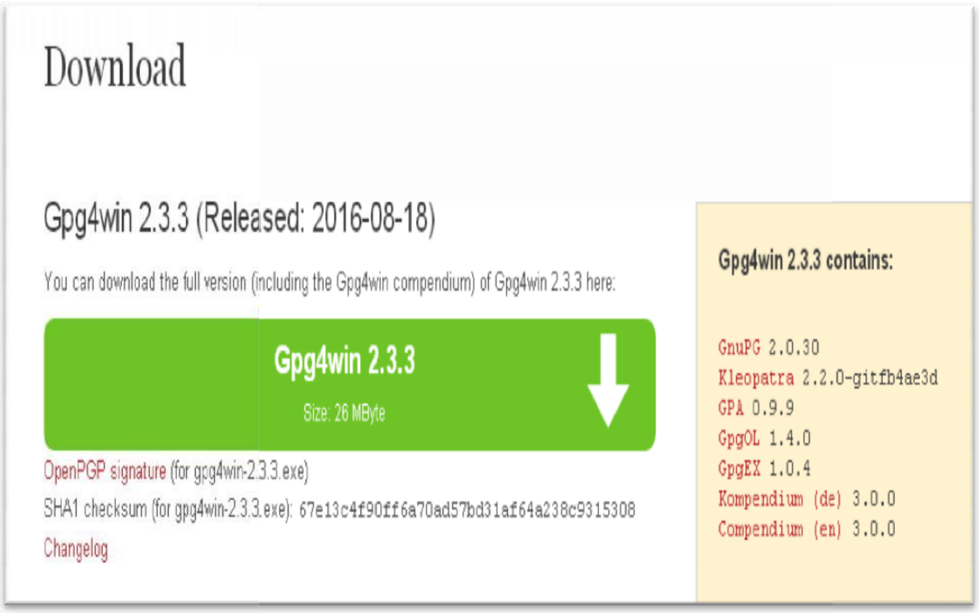
Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).

INTRODUCTION:

- Here's the final guide in my PGP basics series, this time focusing on Windows
- The OS in question will be Windows 7, but it should work for Win8 and Win8.1 as well
- Obviously it's not recommended to be using Windows to access the DNM, but I won't go into the reasons here.
- The tool well be using is GPG4Win

INSTALLING THE SOFTWARE:

1. Visit www.gpg4win.org. Click on the "Gpg4win 2.3.0" button


Download

Gpg4win 2.3.3 (Released: 2016-08-18)

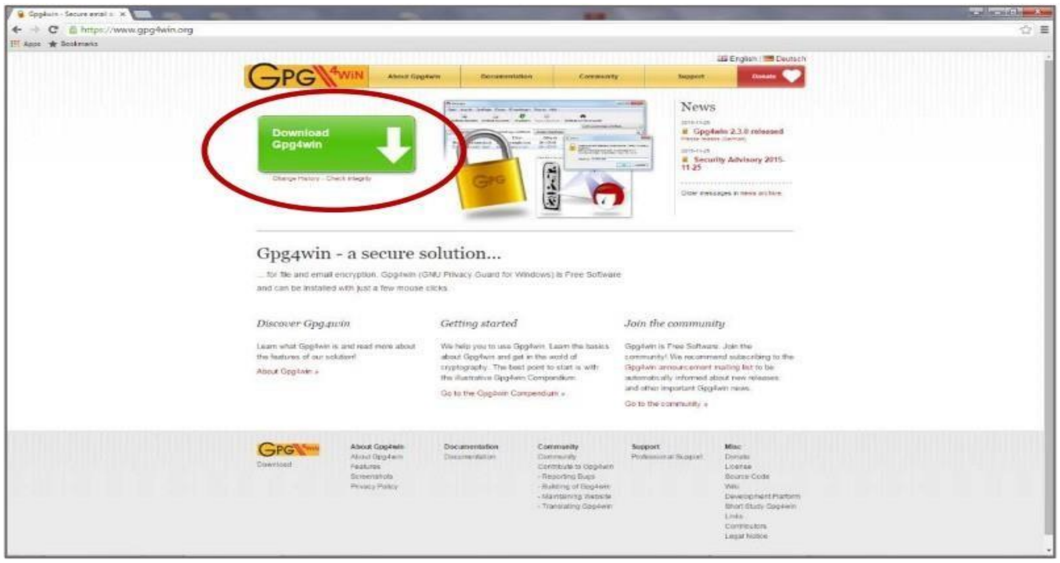
You can download the full version (including the Gpg4win compendium) of Gpg4win 2.3.3 here:

OpenPGP signature (for gpg4win-2.3.3.exe)
SHA1 checksum (for gpg4win-2.3.3.exe): 67e13c4f90ff6a70ad57bd31af64a238c9315308
Changelog

Gpg4win 2.3.3 contains:

GnuPG 2.0.30
Kleopatra 2.2.0-gitfb4ae3d
GPA 0.9.9
GpgOL 1.4.0
GpgEX 1.0.4
Kompendium (de) 3.0.0
Compendium (en) 3.0.0

2. On the following screen, click the “Download Gpg4win” button.



Gpg4win - a secure solution...

... for file and email encryption. Gpg4win (GNU Privacy Guard for Windows) is Free Software and can be installed with just a few mouse clicks.

Discover Gpg4win

Learn what Gpg4win is and read more about the features of our solution!

About Gpg4win »

Getting started

We help you to use Gpg4win. Learn the basics about Gpg4win and get in the world of cryptography. The best point to start is with the illustrative Gpg4win Compendium.

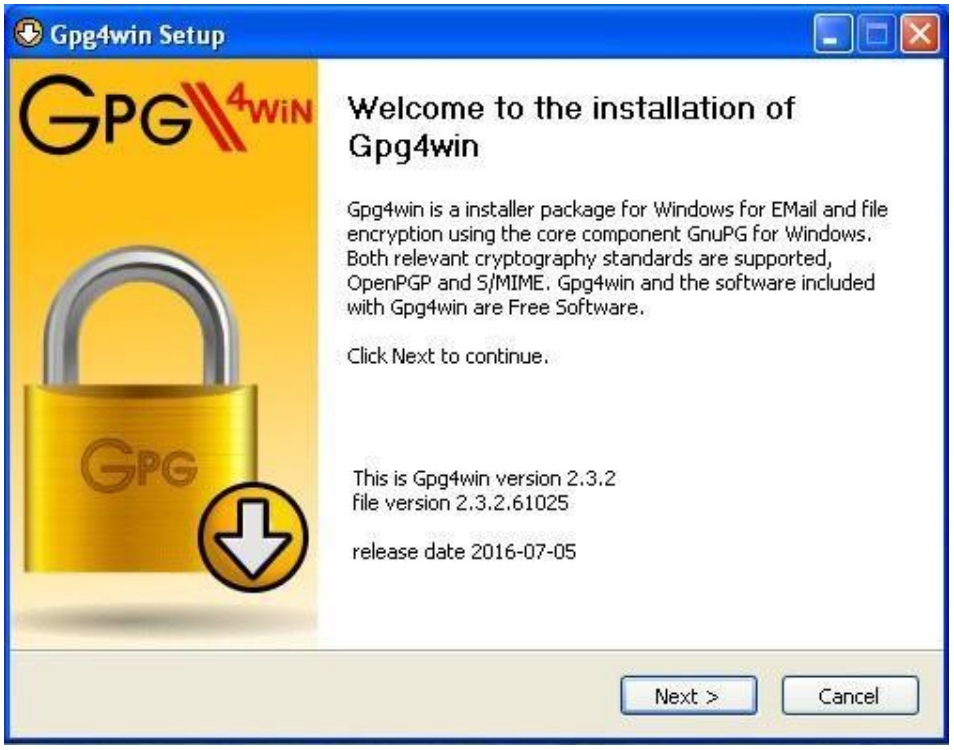
Go to the Gpg4win Compendium »

Join the community

Gpg4win is Free Software. Join the community! We recommend subscribing to the Gpg4win announcement mailing list to be automatically informed about new releases and other important Gpg4win news.

Go to the community »

3. When the “Welcome” screen is displayed, click the “Next” button



Welcome to the installation of Gpg4win

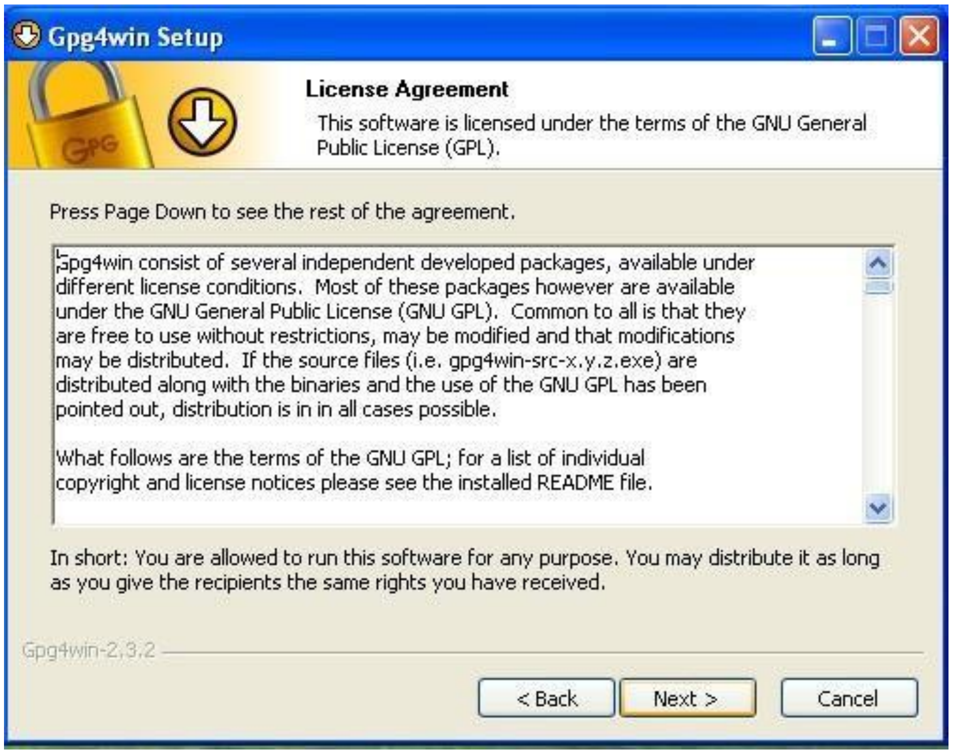
Gpg4win is a installer package for Windows for EMail and file encryption using the core component GnuPG for Windows. Both relevant cryptography standards are supported, OpenPGP and S/MIME. Gpg4win and the software included with Gpg4win are Free Software.

Click Next to continue.

This is Gpg4win version 2.3.2
file version 2.3.2.61025

release date 2016-07-05

4. When the “License Agreement” page is displayed, click the “Next” button



This software is licensed under the terms of the GNU General Public License (GPL).

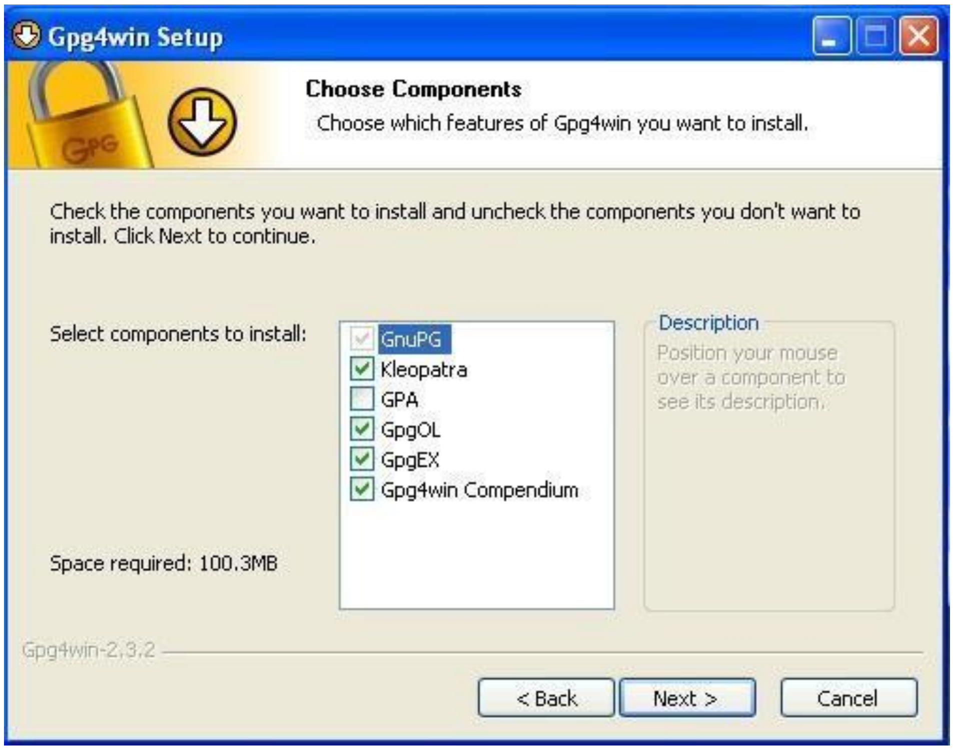
Press Page Down to see the rest of the agreement.

Gpg4win consist of several independent developed packages, available under different license conditions. Most of these packages however are available under the GNU General Public License (GNU GPL). Common to all is that they are free to use without restrictions, may be modified and that modifications may be distributed. If the source files (i.e. gpg4win-src-x.y.z.exe) are distributed along with the binaries and the use of the GNU GPL has been pointed out, distribution is in in all cases possible.

What follows are the terms of the GNU GPL; for a list of individual copyright and license notices please see the installed README file.

In short: You are allowed to run this software for any purpose. You may distribute it as long as you give the recipients the same rights you have received.

5. Set the check box values as specified below, then click the “Next” button



Choose which features of Gpg4win you want to install.

Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.

Select components to install:

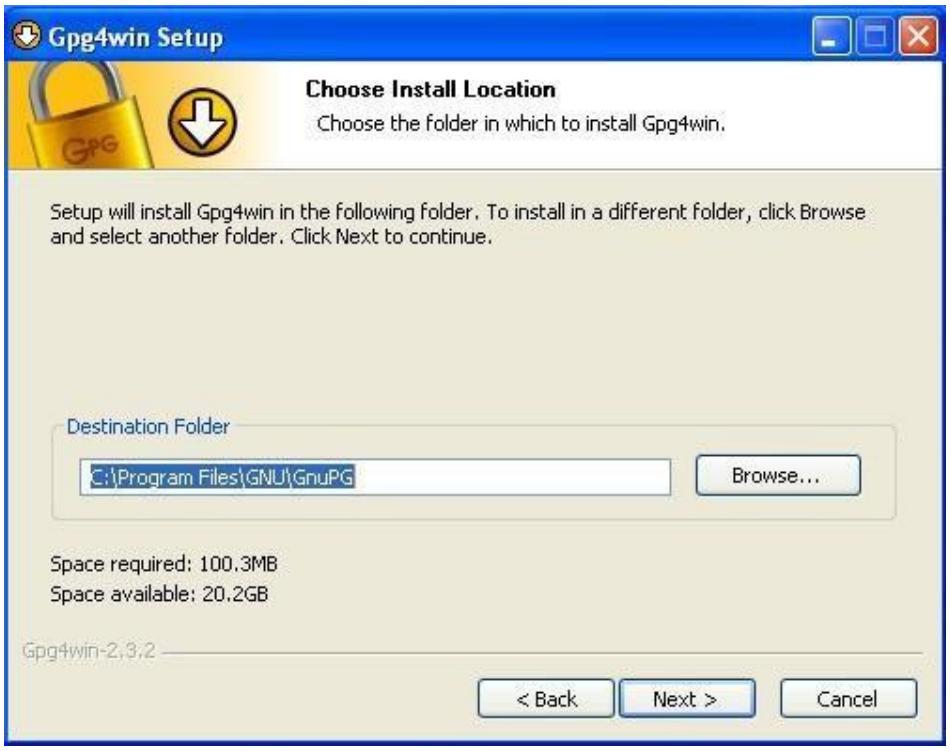
- [✓] GnuPG
- [✓] Kleopatra
- [ ] GPA
- [✓] GpgOL
- [✓] GpgEX
- [✓] Gpg4win Compendium

Description

Position your mouse over a component to see its description.

Space required: 100.3MB

6. Set the location where you want the software to be installed. The default location is fine. Then, click the “Next” button.



Choose Install Location

Choose the folder in which to install Gpg4win.

Setup will install Gpg4win in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.

Destination Folder

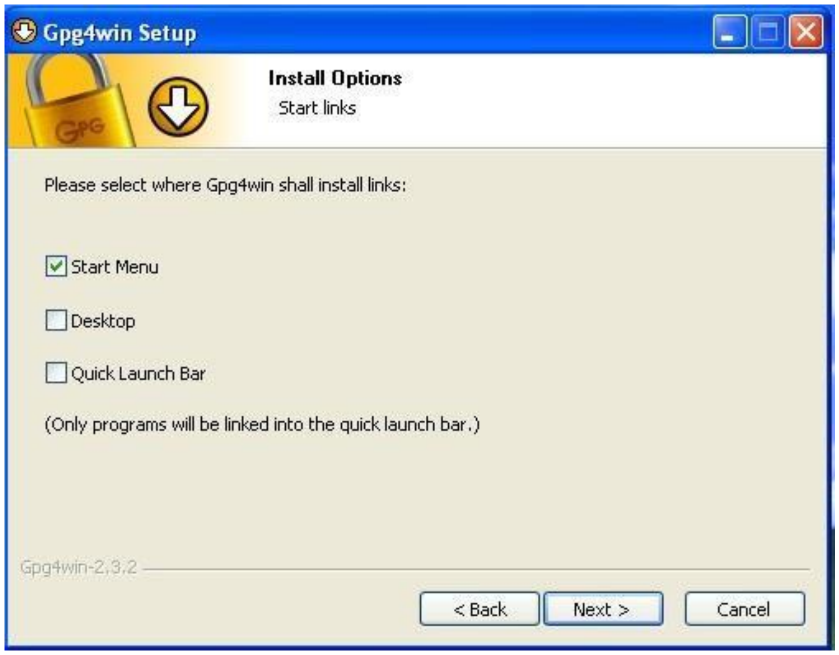
C:\Program Files\GNU\GnuPG

Space required: 100.3MB

Space available: 20.2GB

Gpg4win-2.3.2

7. Specify where you want shortcuts to the software placed, then click the “Next” button.



Install Options

Start links

Please select where Gpg4win shall install links:

☑ Start Menu

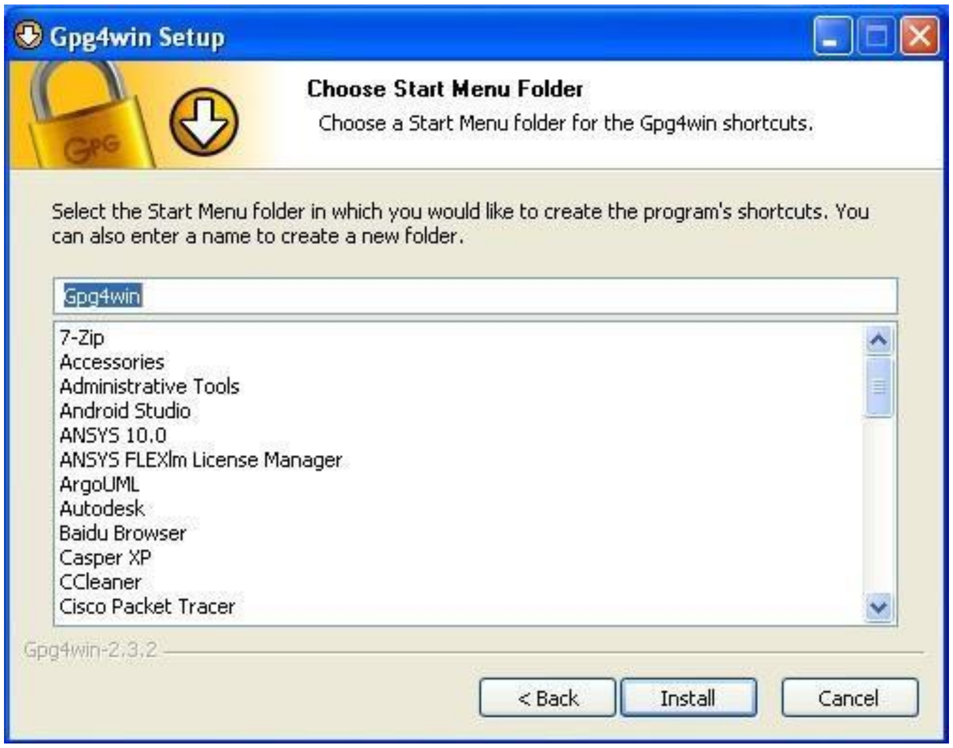
☐ Desktop

☐ Quick Launch Bar

(Only programs will be linked into the quick launch bar.)

Gpg4win-2.3.2

8. If you selected to have a GPG shortcut in your Start Menu, specify the folder in which it will be placed. The default “Gpg4win” is OK. Click the “Install” button to continue



Gpg4win Setup

Choose Start Menu Folder

Choose a Start Menu folder for the Gpg4win shortcuts.

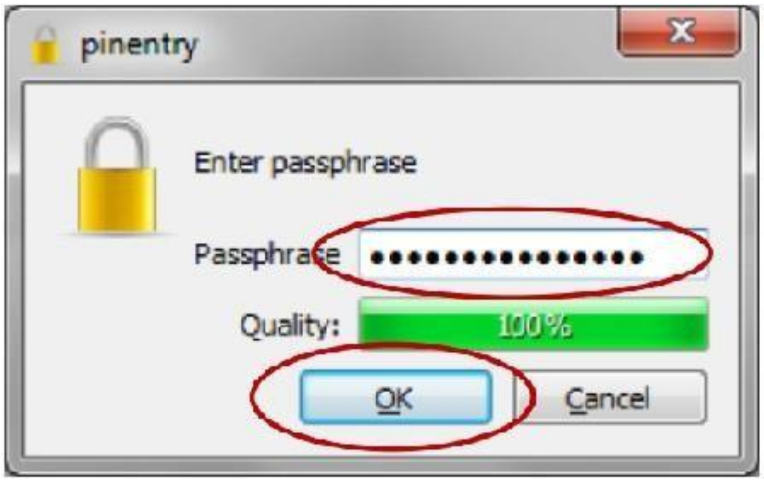
Select the Start Menu folder in which you would like to create the program's shortcuts. You can also enter a name to create a new folder.

Gpg4win

7-Zip
Accessories
Administrative Tools
Android Studio
ANSYS 10.0
ANSYS FLEXlm License Manager
ArgoUML
Autodesk
Baidu Browser
Casper XP
CCleaner
Cisco Packet Tracer

Gpg4win-2.3.2

9. A warning will be displayed if you have Outlook or Explorer opened. If thisoccurs, click the “OK” button.



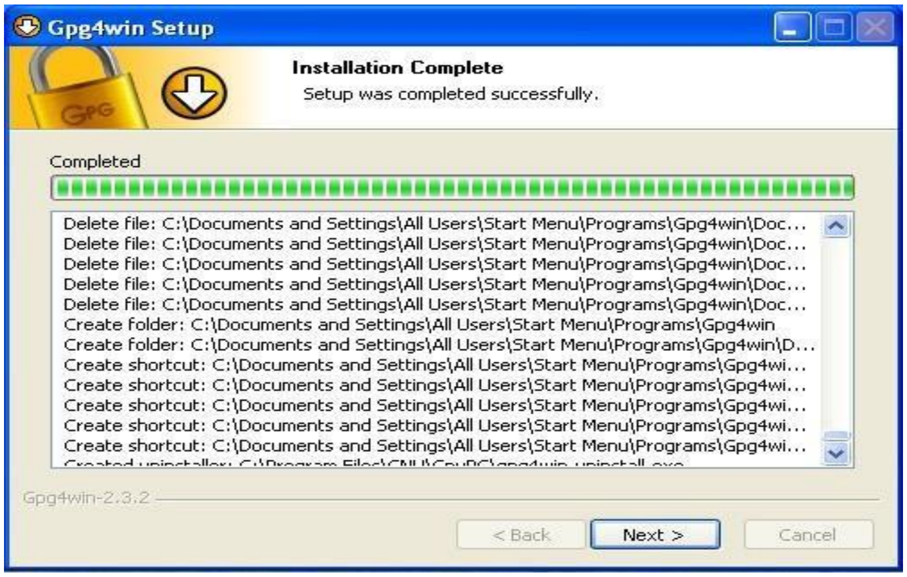
pinentry

Enter passphrase

Passphrase ●●●●●●●●●●●●●●●●

Quality: 100 %

10. The installation process will tell you when it is complete. Click the “Next” button



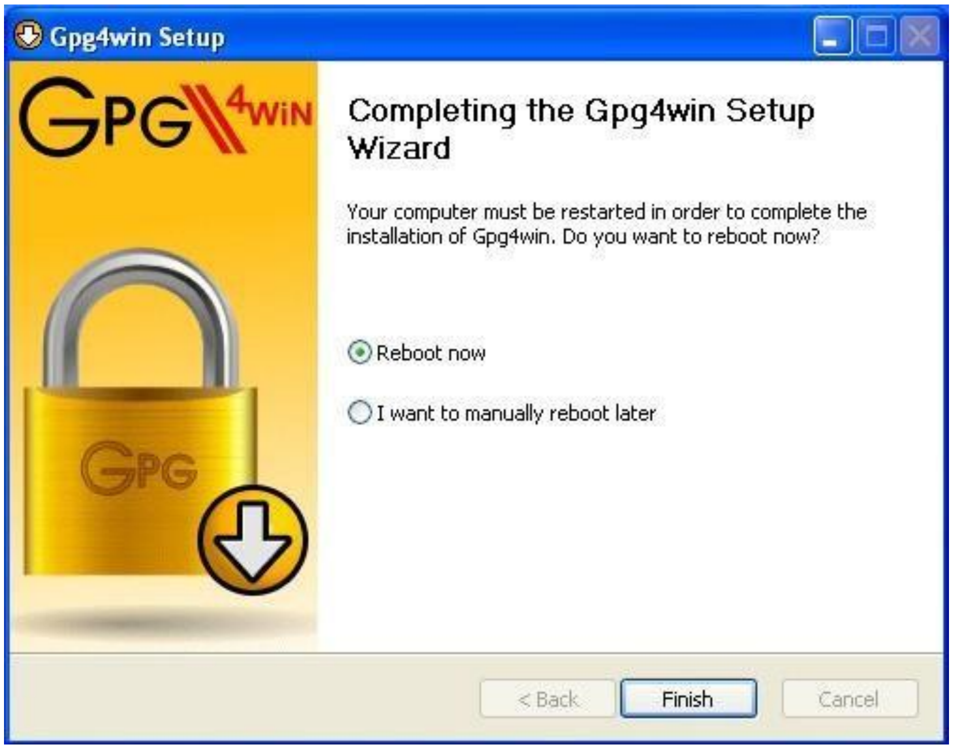
Installation Complete

Setup was completed successfully.

Completed

```
Delete file: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4win\Doc...
Delete file: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4win\Doc...
Delete file: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4win\Doc...
Delete file: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4win\Doc...
Delete file: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4win\Doc...
Create folder: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4win
Create folder: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4win\D...
Create shortcut: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4wi...
Create shortcut: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4wi...
Create shortcut: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4wi...
Create shortcut: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4wi...
Create shortcut: C:\Documents and Settings\All Users\Start Menu\Programs\Gpg4wi...
```

11. Once the Gpg4win setup wizard is complete, the following screen will be displayed. Click the “Finish” button



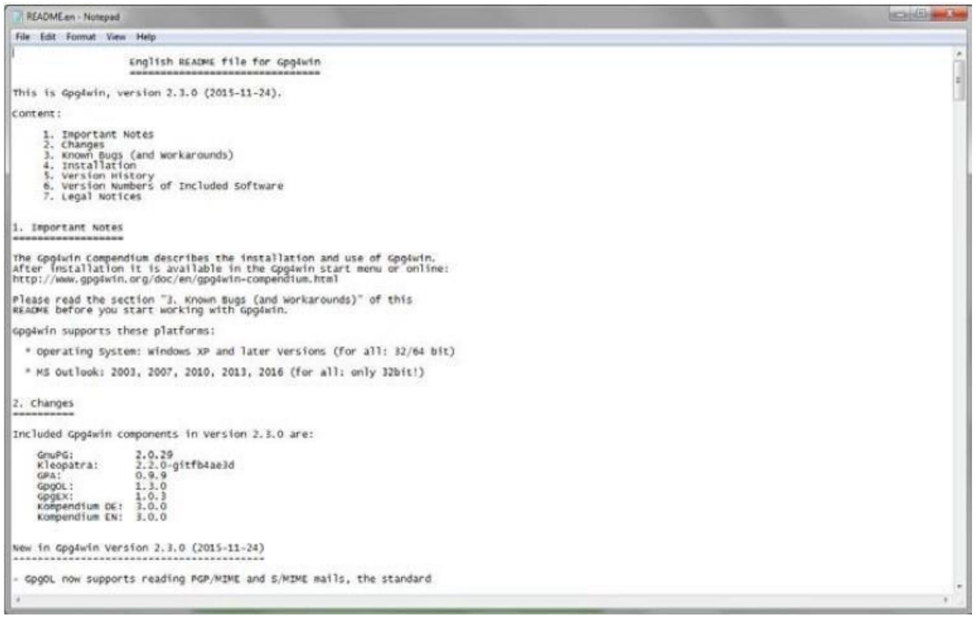
Completing the Gpg4win Setup Wizard

Your computer must be restarted in order to complete the installation of Gpg4win. Do you want to reboot now?

[✓ Reboot now]

I want to manually reboot later

12. If you do not uncheck the “Show the README file” check box, the README file will be displayed. The window can be closed after you’ve reviewed it.

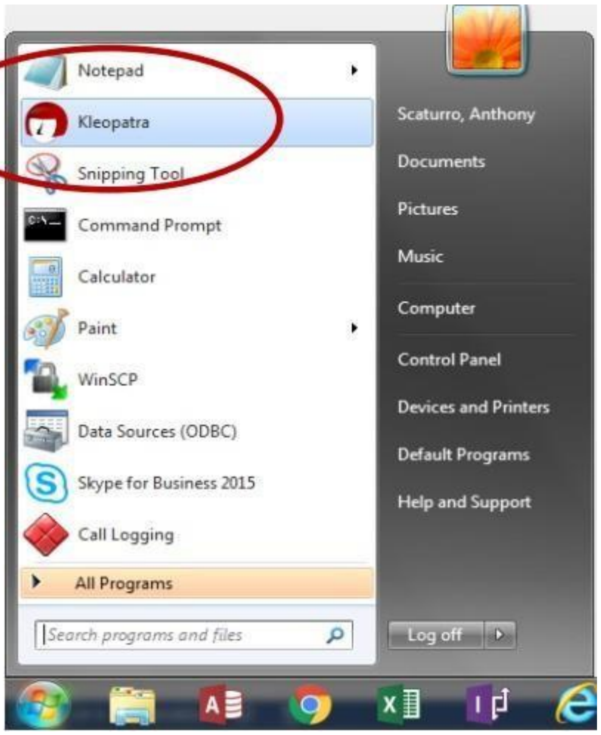


```
                    English README file for Gpg4win
                    ===============================

This is Gpg4win, version 2.3.0 (2015-11-24).

Content:

     1. Important Notes
     2. Changes
     3. Known Bugs (and Workarounds)
     4. Installation
     5. Version History
     6. Version Numbers of Included Software
     7. Legal Notices

1. Important Notes
==================

The Gpg4win Compendium describes the installation and use of Gpg4win.
After installation it is available in the Gpg4win start menu or online:
http://www.gpg4win.org/doc/en/gpg4win-compendium.html

Please read the section "3. Known Bugs (and Workarounds)" of this
README before you start working with Gpg4win.

Gpg4win supports these platforms:

  * Operating System: Windows XP and later Versions (for all: 32/64 bit)

  * MS Outlook: 2003, 2007, 2010, 2013, 2016 (for all: only 32bit!)

2. Changes
==========

Included Gpg4win components in version 2.3.0 are:

    GnuPG:          2.0.29
    Kleopatra:      2.2.0-gitfb4ae3d
    GPA:            0.9.9
    GpgOL:          1.3.0
    GpgEX:          1.0.3
    Kompendium DE:  3.0.0
    Kompendium EN:  3.0.0

New in Gpg4win Version 2.3.0 (2015-11-24)
-----------------------------------------

- GpgOL now supports reading PGP/MIME and S/MIME mails, the standard
```

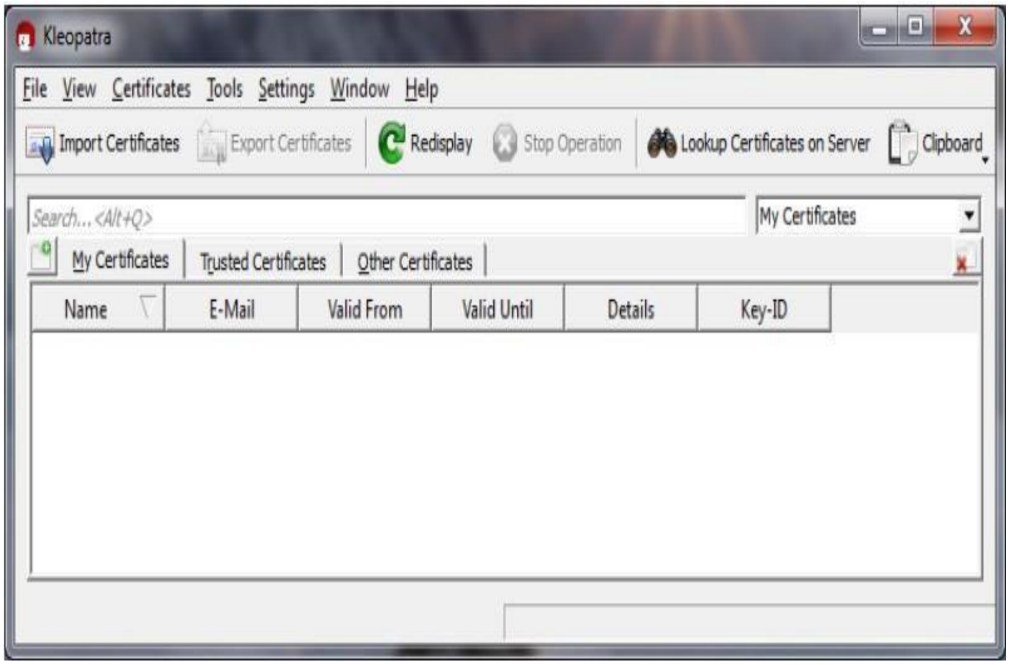
CREATING YOUR PUBLIC AND PRIVATE KEYS

GPG encryption and decryption is based upon the keys of the person who will be receiving the encrypted file or message. Any individual who wants to send the person an encrypted file or message must possess the recipient’s public key certificate to encrypt the message. The recipient must have the associated private key, which is different than thepublic key, to be able to decrypt the file. The public and private key pair for an individual is usually generated by the individual on his or her computer using the installed GPG program, called “Kleopatra” and the following procedure:

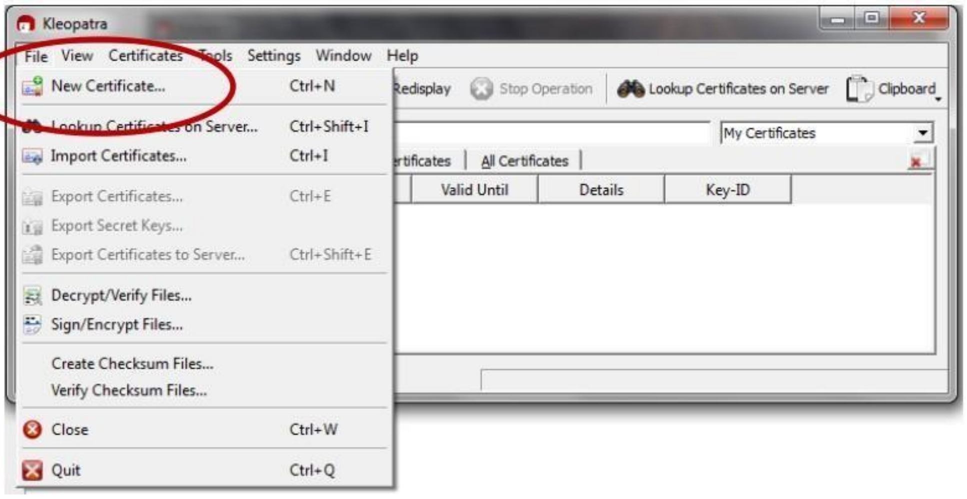
1. From your start bar, select the “Kleopatra” icon to start the Kleopatra certificate management software



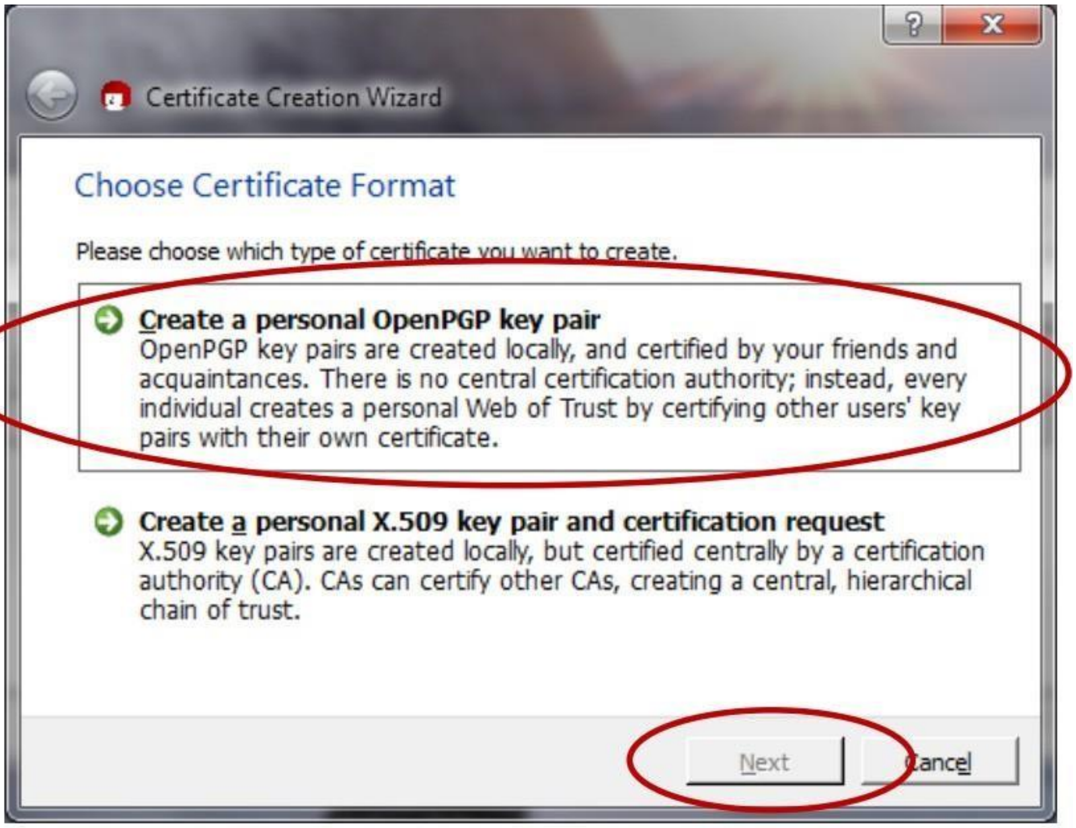
2. The following screen will be displayed



3. From the “File” dropdown, click on the “New Certificate” option


Kleopatra
File View Certificates Tools Settings Window Help
New Certificate... Ctrl+N
Lookup Certificates on Server... Ctrl+Shift+I
Import Certificates... Ctrl+I
Export Certificates... Ctrl+E
Export Secret Keys...
Export Certificates to Server... Ctrl+Shift+E
Decrypt/Verify Files...
Sign/Encrypt Files...
Create Checksum Files...
Verify Checksum Files...
Close Ctrl+W
Quit Ctrl+Q
Redisplay
Stop Operation
Lookup Certificates on Server
Clipboard
My Certificates
All Certificates
Valid Until
Details
Key-ID

4. The following screen will be displayed. Click on “Create a personal OpenGPG key pair” and the “Next” button



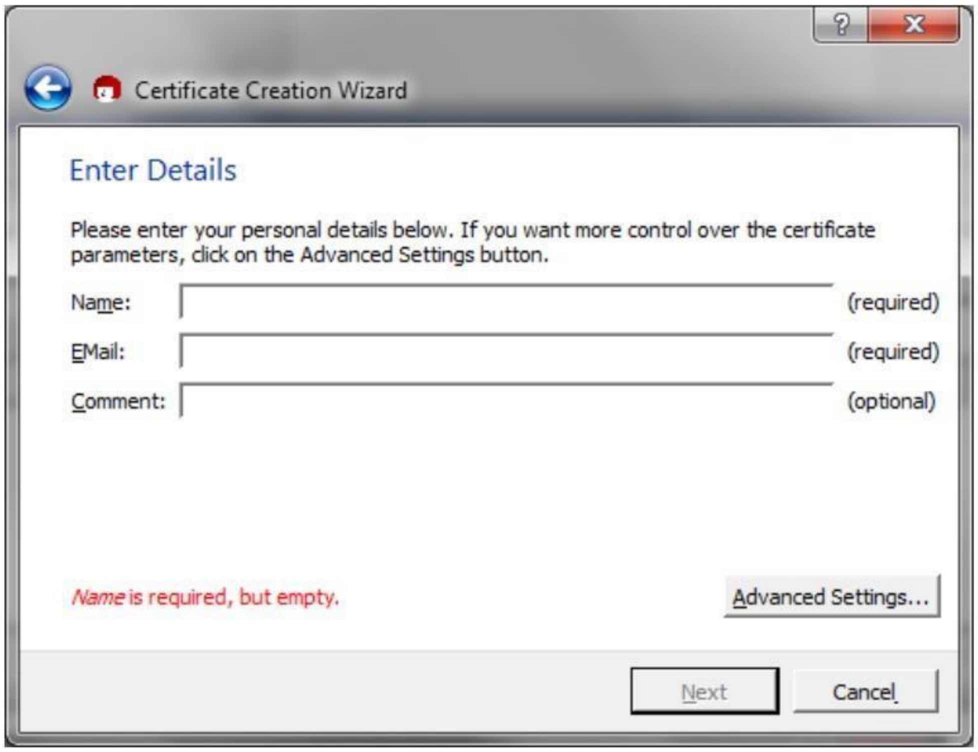
Choose Certificate Format

Please choose which type of certificate you want to create.

Create a personal OpenPGP key pair
OpenPGP key pairs are created locally, and certified by your friends and acquaintances. There is no central certification authority; instead, every individual creates a personal Web of Trust by certifying other users' key pairs with their own certificate.

Create a personal X.509 key pair and certification request
X.509 key pairs are created locally, but certified centrally by a certification authority (CA). CAs can certify other CAs, creating a central, hierarchical chain of trust.

5. The Certificate Creation Wizard will start and display the following:



Certificate Creation Wizard

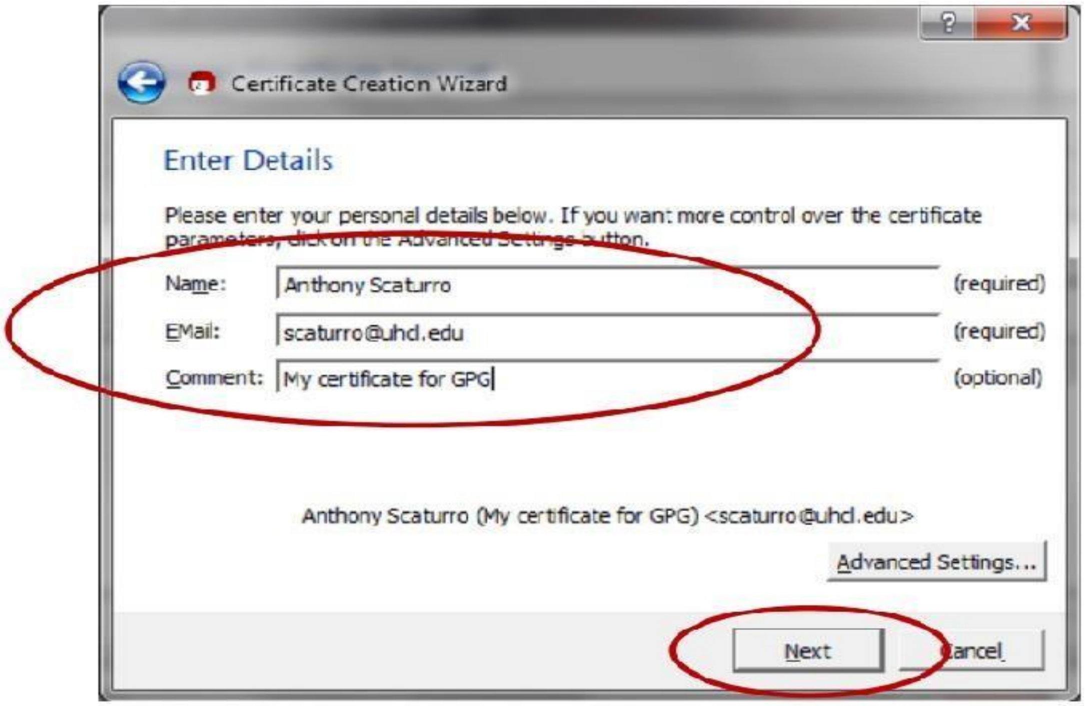
Enter Details

Please enter your personal details below. If you want more control over the certificate parameters, click on the Advanced Settings button.

Name:		(required)
EMail:		(required)
Comment:		(optional)

Name is required, but empty.

6. Enter your name and e-mail address. You may also enter an optional comment. Then, click the “Next” button



Certificate Creation Wizard

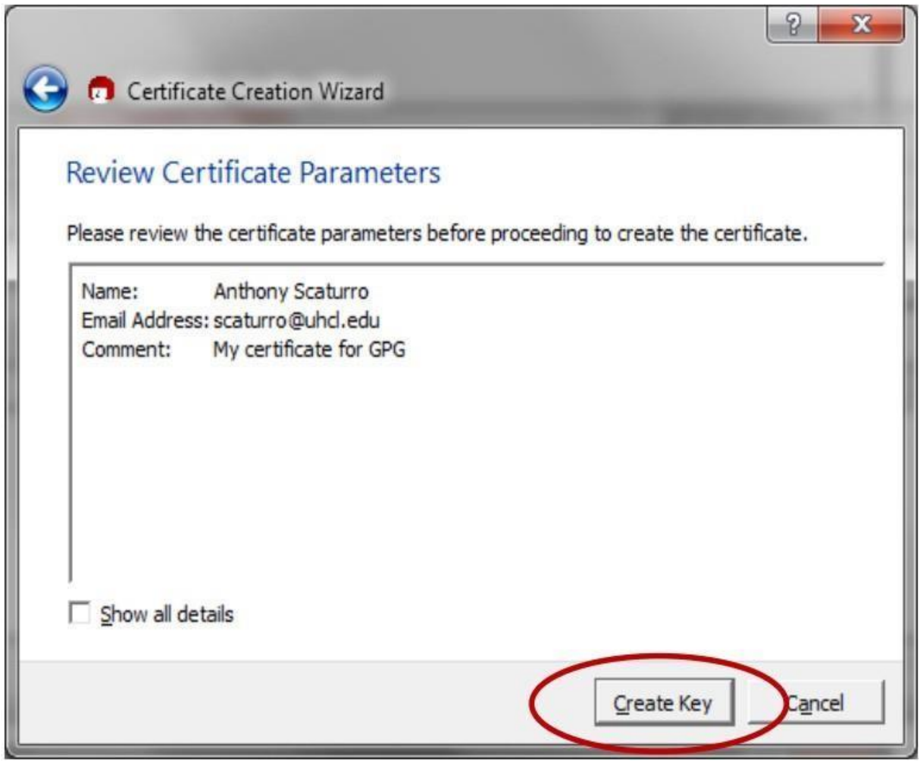
Enter Details

Please enter your personal details below. If you want more control over the certificate parameters, click on the Advanced Settings button.

Name:	Anthony Scaturro	(required)
EMail:	scaturro@uhd.edu	(required)
Comment:	My certificate for GPG	(optional)

Anthony Scaturro (My certificate for GPG) <scaturro@uhd.edu>

7. Review your entered values. If OK, click the “Create Key” button

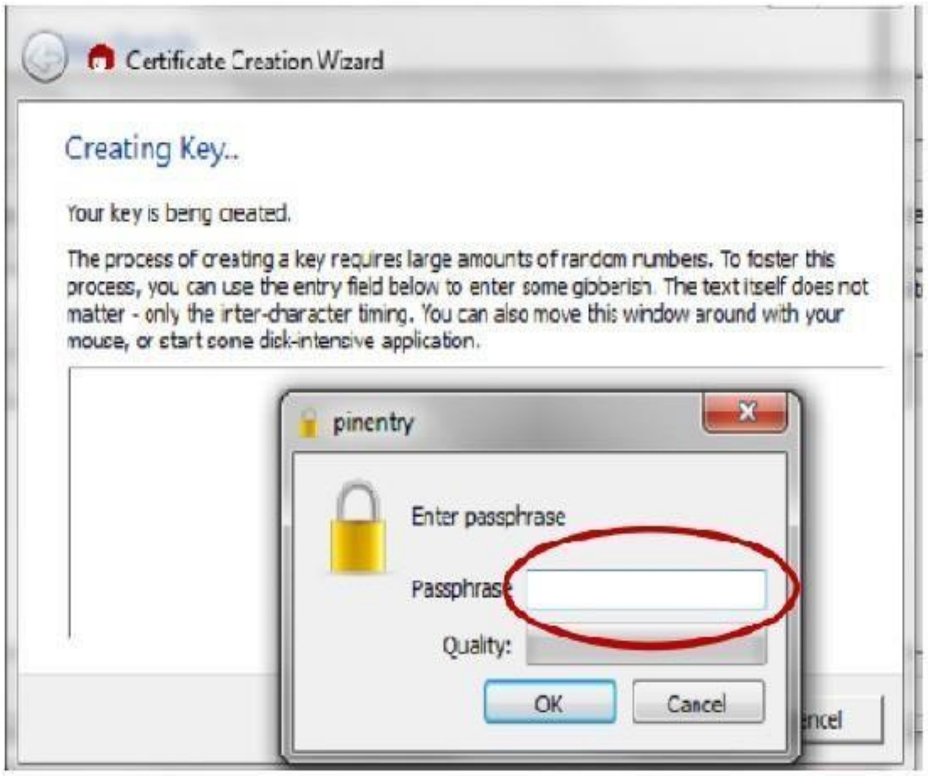


Review Certificate Parameters

Please review the certificate parameters before proceeding to create the certificate.

Name: Anthony Scaturro
Email Address: scaturro@uhcl.edu
Comment: My certificate for GPG

8. You will be asked to enter a passphrase

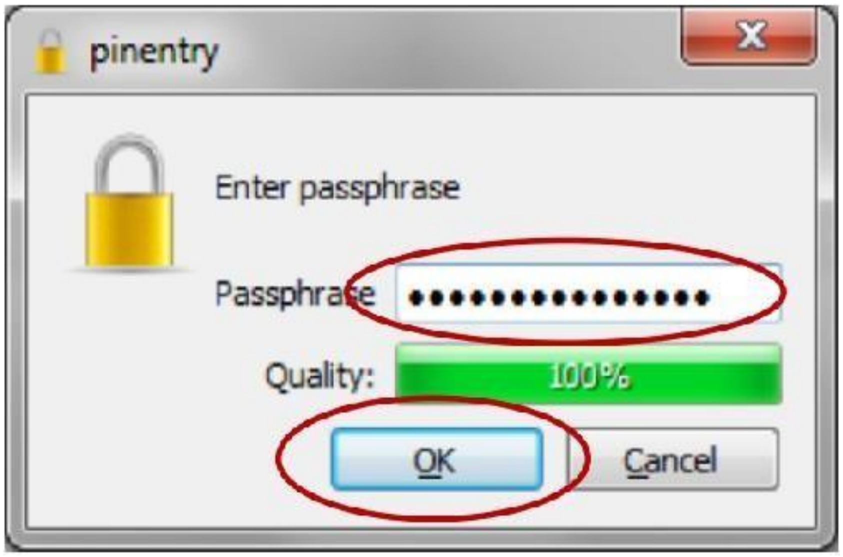


Creating Key..

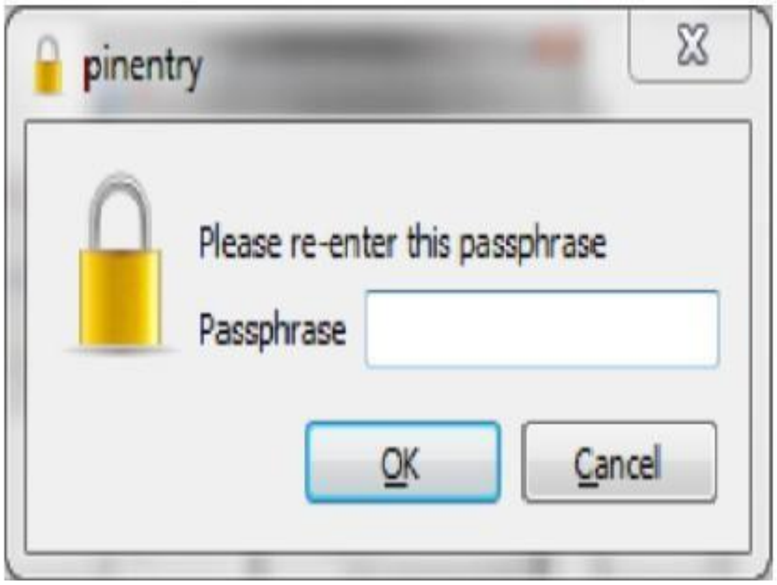
Your key is being created.

The process of creating a key requires large amounts of random numbers. To foster this process, you can use the entry field below to enter some gibberish. The text itself does not matter - only the inter-character timing. You can also move this window around with your mouse, or start some disk-intensive application.

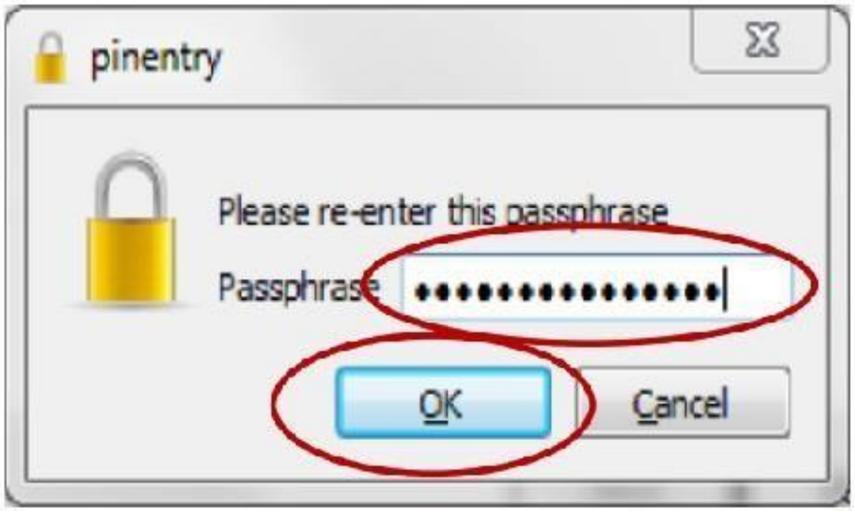
9. The passphrase should follow strong password standards. After you've entered your passphrase, click the "OK" button.



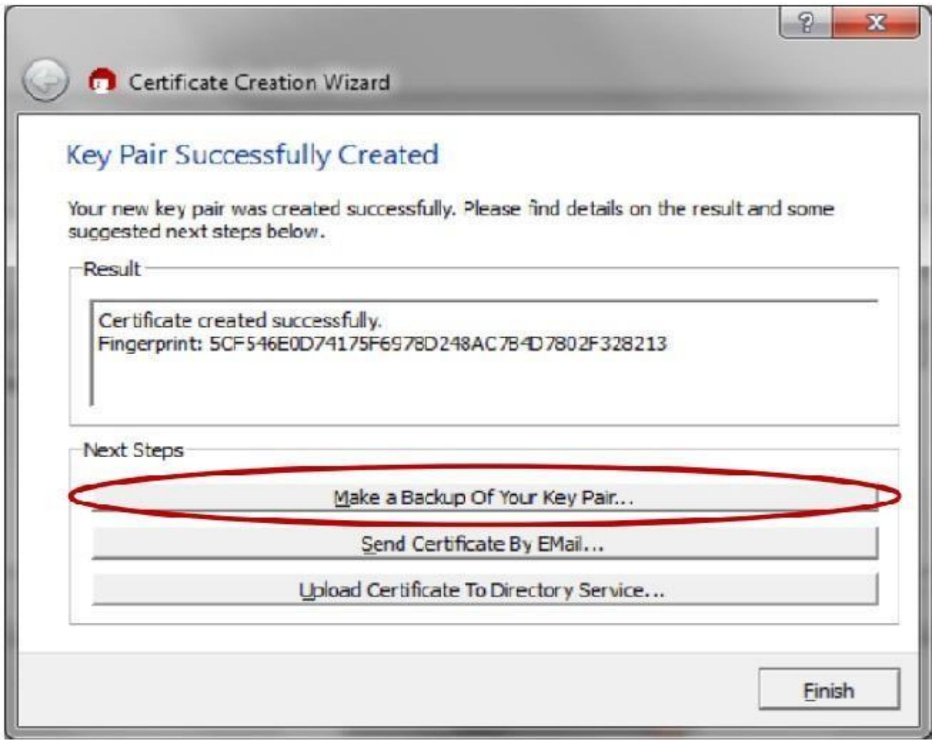
10. You will be asked to re-enter the passphrase



11. Re-enter the passphrase value. Then click the "OK" button. If the passphrases match, the certificate will be created.



12. Once the certificate is created, the following screen will be displayed. You can save a backup of your public and private keys by clicking the "Make a backup Of Your Key Pair" button. This backup can be used to copy certificates onto other authorized computers.


Certificate Creation Wizard

Key Pair Successfully Created

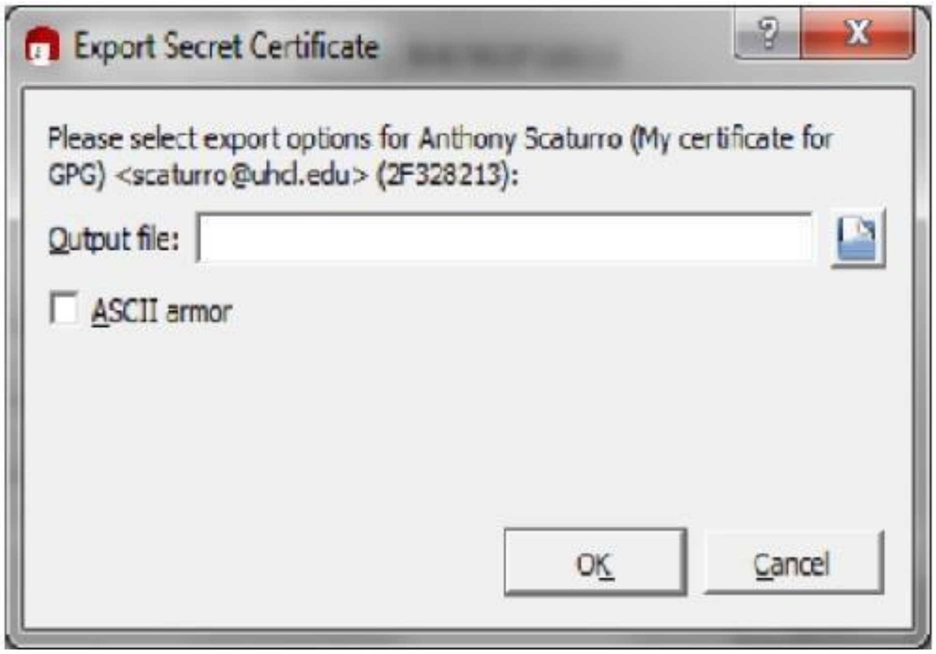
Your new key pair was created successfully. Please find details on the result and some suggested next steps below.

Result

Certificate created successfully.
Fingerprint: 5CF546E0D74175F6978D248AC7B4D7802F328213

Next Steps
Make a Backup Of Your Key Pair...
Send Certificate By EMail...
Upload Certificate To Directory Service...
Finish

13. If you choose to backup your key pair, you will be presented with the following screen:

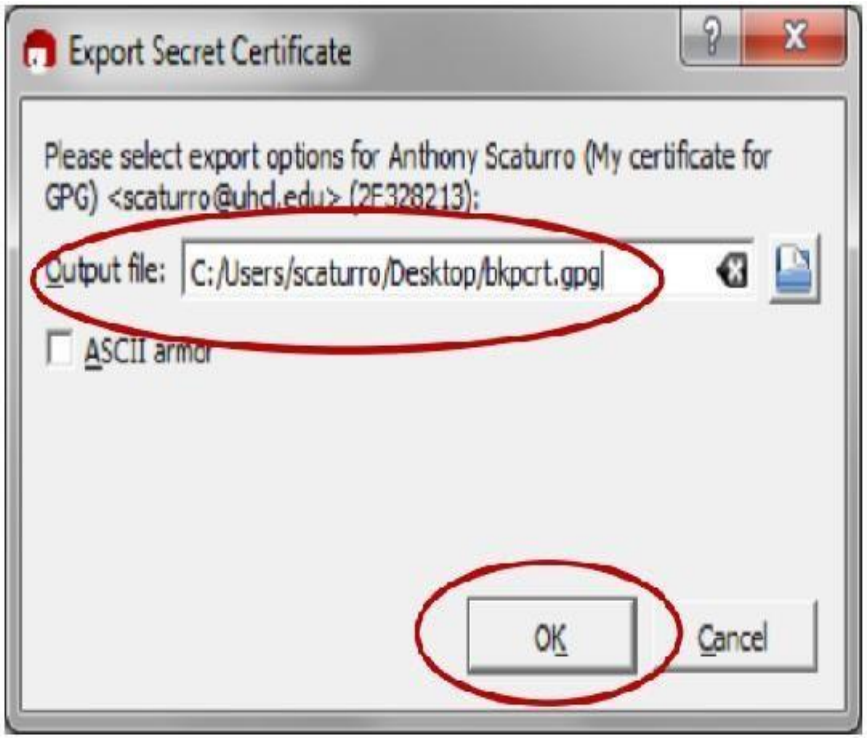


Please select export options for Anthony Scaturro (My certificate for GPG) <scaturro@uhcl.edu> (2F328213):

Output file:

ASCII armor

14. Specify the folder and name the file. Then click the "OK" button.

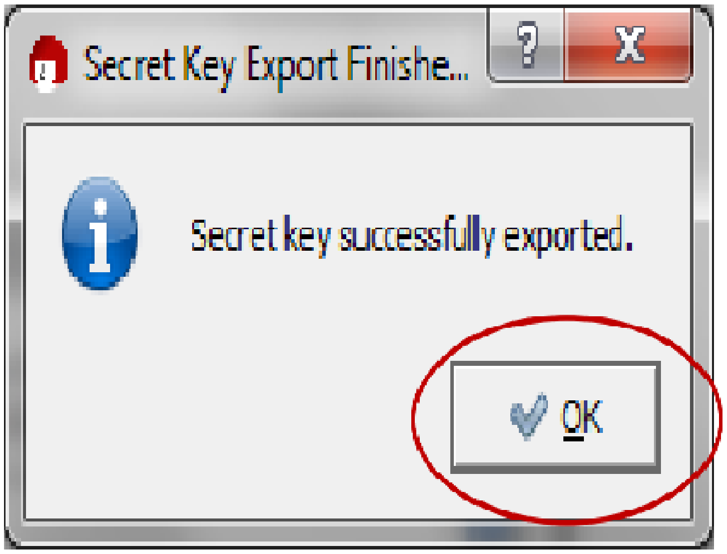


Please select export options for Anthony Scaturro (My certificate for GPG) <scaturro@uhcl.edu> (2F328213):

Output file: C:/Users/scaturro/Desktop/bkpcrt.gpg

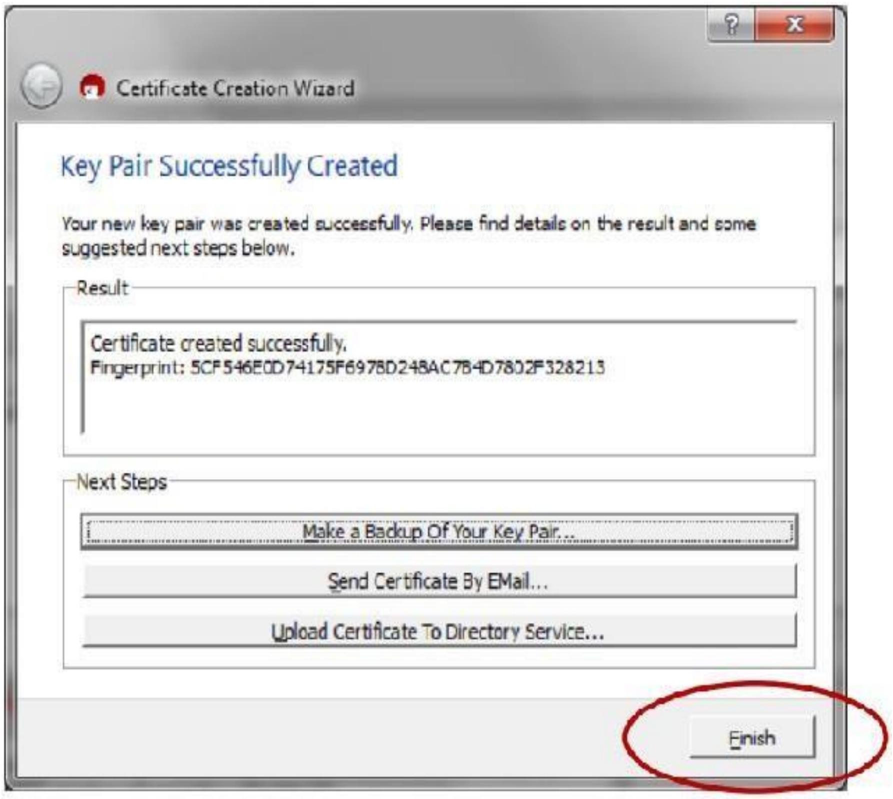
ASCII armor

15. After the key is exported, the following will be displayed. Click the "OK" button.



Secret key successfully exported.

16. You will be returned to the "Key Pair Successfully Created" screen. Click the "Finish" button.


Certificate Creation Wizard
Make a Backup Of Your Key Pair...
Send Certificate By EMail...
Upload Certificate To Directory Service...
Finish

Key Pair Successfully Created

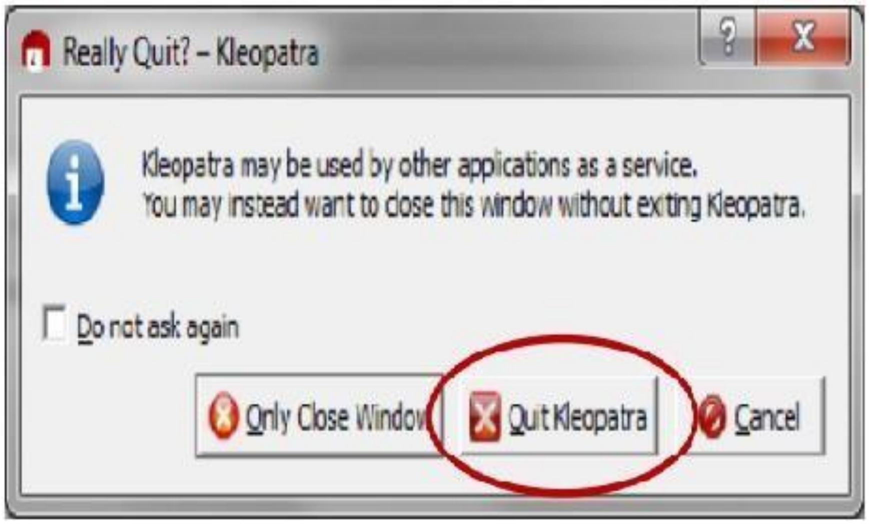
Your new key pair was created successfully. Please find details on the result and some suggested next steps below.

Result

Certificate created successfully.
Fingerprint: 5CF546E0D74175F6978D248AC784D7802F328213

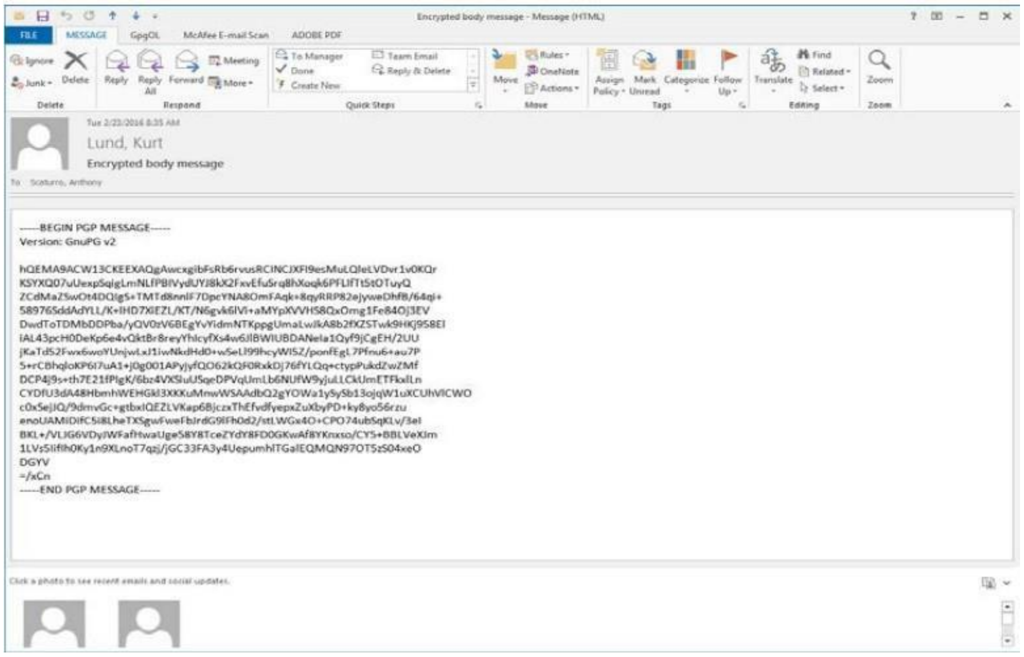
Next Steps

17. Before the program closes, you will need to confirm that you want to close the program by clicking on the “Quit Kleopatra” button


Really Quit? – Kleopatra
Kleopatra may be used by other applications as a service.
You may instead want to close this window without exiting Kleopatra.
Do not ask again
Only Close Window
Quit Kleopatra
Cancel

DECRYPTING AN ENCRYPTED E-MAIL THAT HAS BEEN SENT TO YOU:

1. Open the e-mail message

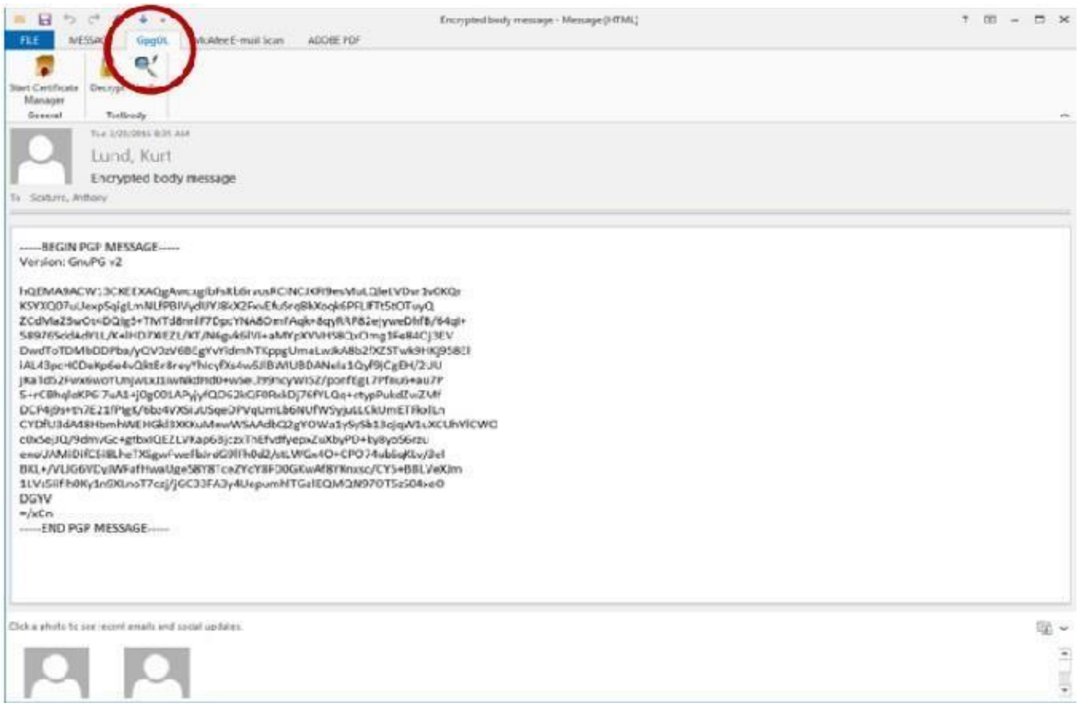


Tue 2/23/2016 8:35 AM
Lund, Kurt
Encrypted body message
To Scaturro, Anthony

```
-----BEGIN PGP MESSAGE-----
Version: GnuPG v2

hQEMA9ACW13CKEEXAQgAwcxgibFsRb6rvusRCINCJXFI9esMuLQIeLVDvr1v0KQr
KSYXQ07uUexpSqigLmNLfPBIVydUYJ8kX2FxvEfuSrq8hXoqk6PFLIfTtStOTuyQ
ZCdMaZSwOt4DQIg5+TMTd8nnIF7DpcYNA8OmFAqk+8qyRRP82ejyweDhfB/64qi+
58976SddAdYLL/K+IHD7XIEZL/KT/N6gvk6lVi+aMYpXVVHS8QxOmg1Fe84Oj3EV
DwdToTDMbDDPba/yQV0zV6BEgYvYidmNTKppgUmaLwJkA8b2fXZSTwk9HKj9S8EI
iAL43pcH0DeKp6e4vQktBr8reyYhlcyfXs4w6JIBWIUBDANela1Qyf9jCgEH/2UU
jKaTd52Fwx6woYUnjwLxJ1iwNkdHd0+wSeLl99hcyWI5Z/ponfEgL7Pfnu6+au7P
5+rCBhqloKP6I7uA1+j0g001APyjyfQO62kQF0RxkDj76fYLQq+ctypPukdZwZMf
DCP4j9s+th7E21fPlgK/6bz4VXSluUSqeDPVqUmLb6NUfW9yjuLLCkUmETFkxlLn
CYDfU3dA48HbmhWEHGkI3XKKuMnwWSAAdbQ2gYOWa1ySySb13ojqW1uXCUhVICWO
c0xSejJQ/9dmvGc+gtbxIQEZLVKap6BjczxThEfvdfyepxZuXbyPD+ky8yo56rzu
enoUAMIDifC5i8LheTXSgwFweFbJrdG9lFh0d2/stLWGx4O+CPO74ubSqKLv/3eI
BKL+/VLJG6VDyJWFafHwaUge58Y8TceZYdY8FD0GKwAf8YKnxso/CY5+BBLVeXIm
1LVs5lifIh0Ky1n9XLnoT7qzj/jGC33FA3y4UepumhlTGaIEQMQN97OT5zS04xeO
DGYV
=/xCn
-----END PGP MESSAGE-----
```

Click a photo to see recent emails and social updates.

2. Select the GpgOL tab


Encrypted body message - Message (HTML)
FILE
MESSAGE
GpgOL
McAfee E-mail Scan
ADOBE PDF
Start Certificate Manager
Decrypt
General
TextBody
Click a photo to see recent emails and social updates.

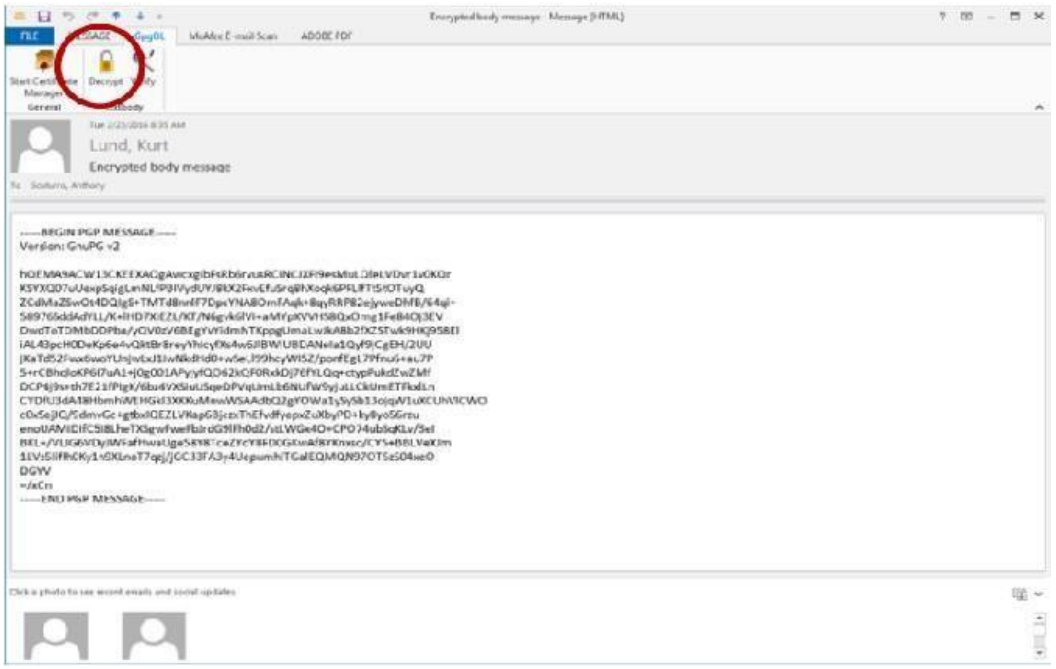
Lund, Kurt

Encrypted body message

To Scaturro, Anthony

```
-----BEGIN PGP MESSAGE-----
Version: GnuPG v2

hQEMA9ACW13CKEEXAQgAvrcugIbFsKLb6rvusRCINCJKPI9esVluLQIeLVDvr1vOKQr
KSYXQD7uUexpSqigLmNLfPBIVydUY/8kX2FevEfu5rqBkXoqk6PFLIFTt5tOTuyQ
ZCdMaZ5wOt+DQIg5+TMTd8nnlF7DpcYNA8OmfAqk+8qyRAP82ejyweDhfB/64gl+
58976SddAdYLL/K+lHD7XEZL/KT/N6gvk6lVi+aMYpKVVH58QxOmg1FeB4CJ3EV
DwdToTDMbDDPba/yQV0zV6BEgYvYidmNTKppgUmaLwJkA8b2fXZ5Twk9HKj958ZI
iAL43pcHODeKp6e4vQktEr8reyYhicyfXs4w6JIBWUBDANela1Qyf9jCgEH/2JU
jKa1d52Fwx6woYUnjwLxJ1iwNkdHd0+wSeJ99hcyWI5Z/ponfEgL7Pfnu6+au7P
5+rCBhqloKP6I7uA1+jOg0O1APyjyfQD62kGF0RxkDj76fYLQq+ctypPukdZwZMf
DCP4j9s+th7E21fPlgK/6bz4VXSiuUSqeDPVqUmLb6NUfWSyjuLLCkUmETFkoILn
CYDfU3dA48HbmhWEHGkl3XKKuMewWSAAdbQ2gYOWa1ySySb13ojqW1uXCUhVlCWO
c0x5ejJQ/9dmvGc+gtbxIQEZLVKap63jczxThEfvdfyepxZuXbyPD+by8yo56rzu
enoUAMiDIfCSI8LheTXSgwfwefbirdG9Ifh0d2/stLWGx4O+CPO74ub6qKLv/3el
BKL+/VUG6VDyIWFafHwaUge58Y8TcaZYcY8FD0GKwAf8YKnxsc/CY5+B8LVeXJm
1LVi5IIFh0Ky1n9XLnoT7qzj/jGC33FA3y4UepumNTGaIEQMQN97OT5z504xeO
DGYV
=/xCn
-----END PGP MESSAGE-----
```

3. Click the “Decrypt” button


Encrypted body message - Message (HTML)
FILE
MESSAGE
GpgOL
McAfee E-mail Scan
ADOBE PDF
Start Certificate Manager
Decrypt
Verify
General
TextBody
Click a photo to see recent emails and social updates.

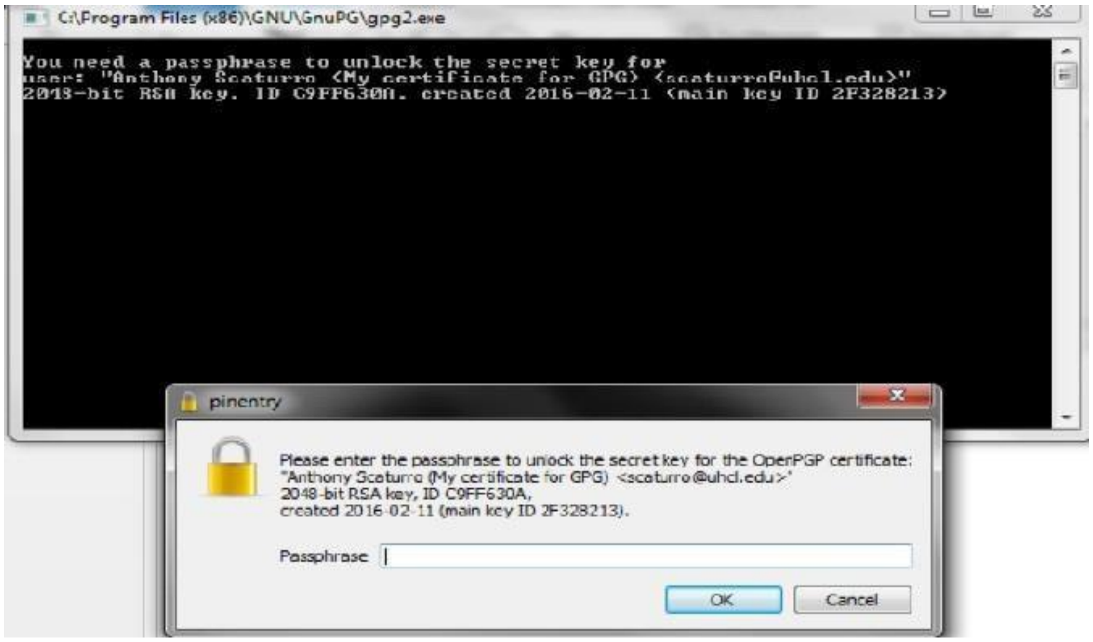
Lund, Kurt

Encrypted body message

To Scaturro, Anthony

```
-----BEGIN PGP MESSAGE-----
Version: GnuPG v2

hQEMA9ACW13CKEEXAQgAvrcugIbFsKLb6rvusRCINCJKPI9esVluLQIeLVDvr1vOKQr
KSYXQD7uUexpSqigLmNLfPBIVydUY/8kX2FevEfu5rqBkXoqk6PFLIFTt5tOTuyQ
ZCdMaZ5wOt+DQIg5+TMTd8nnlF7DpcYNA8OmfAqk+8qyRAP82ejyweDhfB/64gl+
58976SddAdYLL/K+lHD7XEZL/KT/N6gvk6lVi+aMYpKVVH58QxOmg1FeB4CJ3EV
DwdToTDMbDDPba/yQV0zV6BEgYvYidmNTKppgUmaLwJkA8b2fXZ5Twk9HKj958ZI
iAL43pcHODeKp6e4vQktEr8reyYhicyfXs4w6JIBWUBDANela1Qyf9jCgEH/2JU
jKa1d52Fwx6woYUnjwLxJ1iwNkdHd0+wSeJ99hcyWI5Z/ponfEgL7Pfnu6+au7P
5+rCBhqloKP6I7uA1+jOg0O1APyjyfQD62kGF0RxkDj76fYLQq+ctypPukdZwZMf
DCP4j9s+th7E21fPlgK/6bz4VXSiuUSqeDPVqUmLb6NUfWSyjuLLCkUmETFkoILn
CYDfU3dA48HbmhWEHGkl3XKKuMewWSAAdbQ2gYOWa1ySySb13ojqW1uXCUhVlCWO
c0x5ejJQ/9dmvGc+gtbxIQEZLVKap63jczxThEfvdfyepxZuXbyPD+by8yo56rzu
enoUAMiDIfCSI8LheTXSgwfwefbirdG9Ifh0d2/stLWGx4O+CPO74ub6qKLv/3el
BKL+/VUG6VDyIWFafHwaUge58Y8TcaZYcY8FD0GKwAf8YKnxsc/CY5+B8LVeXJm
1LVi5IIFh0Ky1n9XLnoT7qzj/jGC33FA3y4UepumNTGaIEQMQN97OT5z504xeO
DGYV
=/xCn
-----END PGP MESSAGE-----
```

4. A command window will open along with a window that asks for the Passphrase to your private key that will be used to decrypt the incoming message.

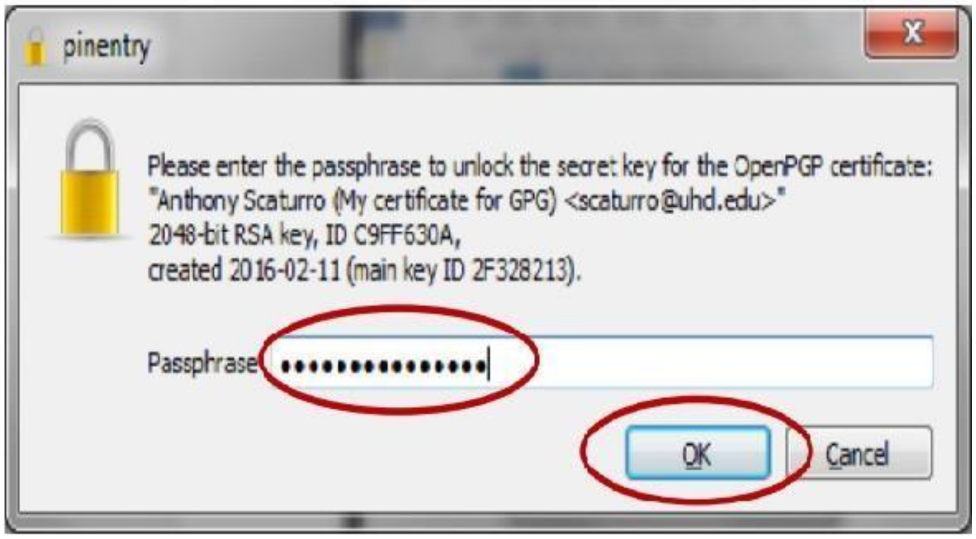


```
You need a passphrase to unlock the secret key for
user: "Anthony Scaturro (My certificate for GPG) <scaturro@uhcl.edu>"
2048-bit RSA key, ID C9FF630A, created 2016-02-11 (main key ID 2F328213)
```

Please enter the passphrase to unlock the secret key for the OpenPGP certificate:
"Anthony Scaturro (My certificate for GPG) <scaturro@uhcl.edu>"
2048-bit RSA key, ID C9FF630A,
created 2016-02-11 (main key ID 2F328213).

Passphrase

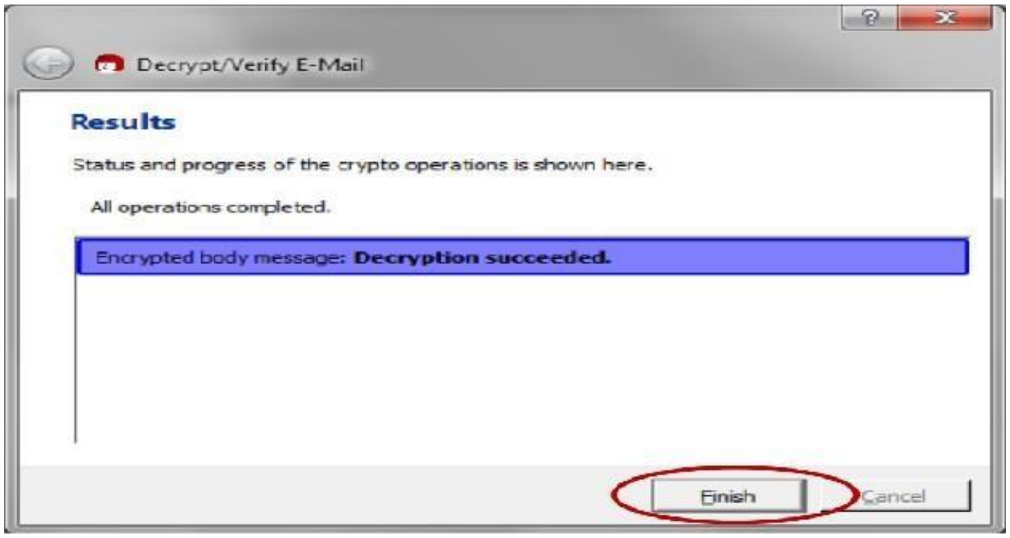
5. Enter your passphrase and click the “OK” button



Please enter the passphrase to unlock the secret key for the OpenPGP certificate:
"Anthony Scaturro (My certificate for GPG) <scaturro@uhcl.edu>"
2048-bit RSA key, ID C9FF630A,
created 2016-02-11 (main key ID 2F328213).

Passphrase ••••••••••••••••

6. The results window will tell you if the decryption succeeded. Click the “Finish” button top close the window


Decrypt/Verify E-Mail

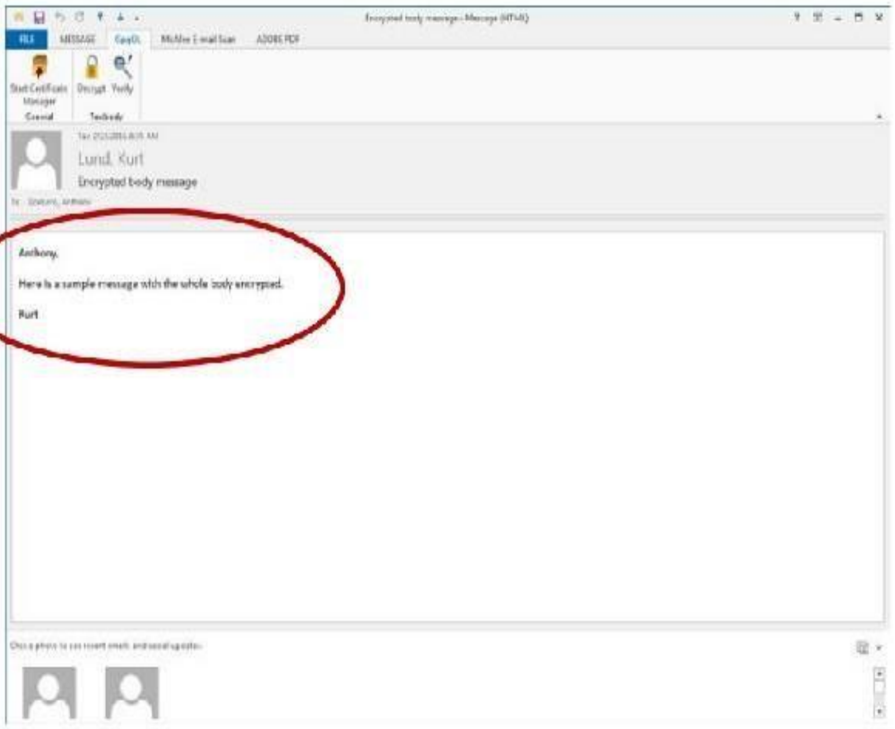
Results

Status and progress of the crypto operations is shown here.

All operations completed.

Encrypted body message: **Decryption succeeded.**

7. Your unencrypted e-mail message body will be displayed.



Lund, Kurt

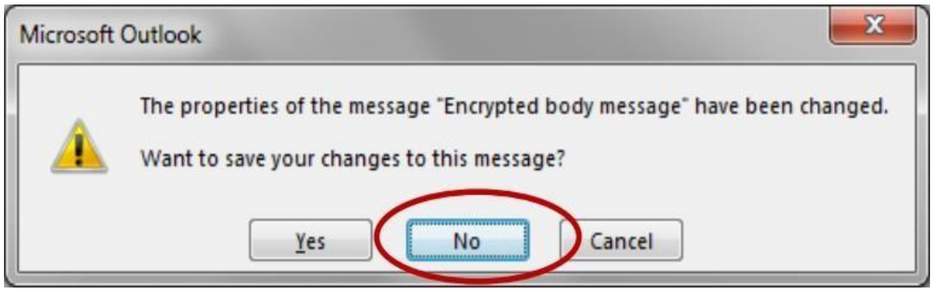
Encrypted body message

Anthony,

Here is a sample message with the whole body encrypted.

Kurt

8. When you close the e-mail you will be asked if you want to save the e-mail message in its unencrypted form. For maximum security, click the “No” button. This will keep the message encrypted within the e-mail system and will require you to enter your passphrase each time you reopen the e-mail message



The properties of the message "Encrypted body message" have been changed.

Want to save your changes to this message?

RESULT:

Thus the secure data storage, secure data transmission and for creating digital signatures (GnuPG) was developed successfully.

WORKING WITH SNORT TOOL TO DEMONSTRATE INTRUSION DETECTION SYSTEM

AIM:

Snort is an open source network intrusion detection system (NIDS) and it is a packet sniffer that monitors network traffic in real time.

INTRODUCTION:

INTRUSION DETECTION SYSTEM :

Intrusion detection is a set of techniques and methods that are used to detect suspicious activity both at the network and host level. Intrusion detection systems fall intotwo basic categories:

- ✓ Signature-based intrusion detection systems
- ✓ Anomaly detection systems.

Intruders have signatures, like computer viruses, that can be detected using software. You try to find data packets that contain any known intrusion-related signatures or anomalies related to Internet protocols. Based upon a set of signatures and rules, the detection system is able to find and log suspicious activity and generate alerts.

Anomaly-based intrusion detection usually depends on packet anomalies present in protocol header parts. In some cases these methods produce better results compared to signature-based IDS. Usually an intrusion detection system captures data from the networkand applies its rules to that data or detects anomalies in it. Snort is primarily a rule-basedIDS, however input plug-ins are present to detect anomalies in protocol headers.

SNORT TOOL:

Snort is based on libpcap (for library packet capture), a tool that is widely used in TCP/IPtraffic sniffers and analyzers. Through protocolanalysis and content searching and matching, Snort detects attack methods, including denial of service, buffer overflow, CGI attacks, stealthport scans, and SMB probes. When suspicious behavior is detected, Snort sends a real-time alert to syslog, a separate 'alerts' file, or to apop-up window.

Snort is currently the most popular free network intrusion detection software. The advantages of Snort are numerous. According to the snort web site, “It can perform protocol analysis, content searching/matching, and can be used to detect a variety of attacks and probes, such as buffer overflow, stealth port scans, CGI attacks, SMB probes, OS fingerprinting attempts, and much more" (Caswell).

One of the advantages of Snort is its ease of configuration. Rules are very flexible, easily written, and easily inserted into the rule base. If a new exploit or attack is found a rulefor the attack can be added to the rule base in a matter of seconds. Another advantage of snort is that it allows for raw packet data analysis.

SNORT can be configured to run in three modes:

1. Sniffer mode
2. Packet Logger mode
3. Network Intrusion Detection System mode

1. **Sniffer mode**
   - ✓ **Snort –v** Print out the TCP/IP packets header on the screen
   - ✓ **Snort –vd** show the TCP/IP ICMP header with application data in transmit
2. **Packet Logger mode**
   - ✓ **snort –dev –l c:\log** [create this directory in the C drive] and snort will automatically know to go into packet logger mode, it collects every packet it sees and places it in log directory.
   - ✓ **snort –dev –l c:\log –h ipaddress/24**:This rule tells snort that you want to print out the data link and TCP/IP headers as well as application data into the log directory. snort –l c:\log –b This is binary mode logs everything into a single file.
3. **Network Intrusion Detection System mode**
   - ✓ **snort –d c:\log –h ipaddress/24 –c snort.conf** This is a configuration file applies rule to each packet to decide it an action based upon the rule type in the file.
   - ✓ **Snort –d –h ipaddress/24 –l c:\log –c snort.conf** This will cnfigure snort to run in its most basic NIDS form, logging packets that trigger rules specifies in the snort.conf.

PROCEDURE:

STEP-1: Sniffer mode☐ snort –v ☐ Print out the TCP/IP packets header on the screen.

STEP-2: Snort –vd ☐ Show the TCP/IP ICMP header with application data in transit.

STEP-3: Packet Logger mode ☐ snort –dev –l c:\log [create this directory in the C drive] and snort will automatically know to go into packet logger mode, it collects every packet it sees and places it in log directory.

STEP-4: snort –dev –l c:\log –h ipaddress/24 ☐ This rule tells snort that you want to print out the data link and TCP/IP headers as well as application data into the log directory.

STEP-5: snort –l c:\log –b ☐ this binary mode logs everything into a single file.

STEP-6: Network Intrusion Detection System mode ☐ snort –d c:\log –h ipaddress/24 –c snort.conf ☐ This is a configuration file that applies rule to each packet to decide it an action based upon the rule type in the file.

STEP-7: snort –d –h ip address/24 –l c:\log –c snort.conf ☐ This will configure snort to run in its most basic NIDS form, logging packets that trigger rules specifies in the snort.conf.

STEP-8: Download SNORT from snort.org. Install snort with or without database support.

STEP-9: Select all the components and Click Next. Install and Close.

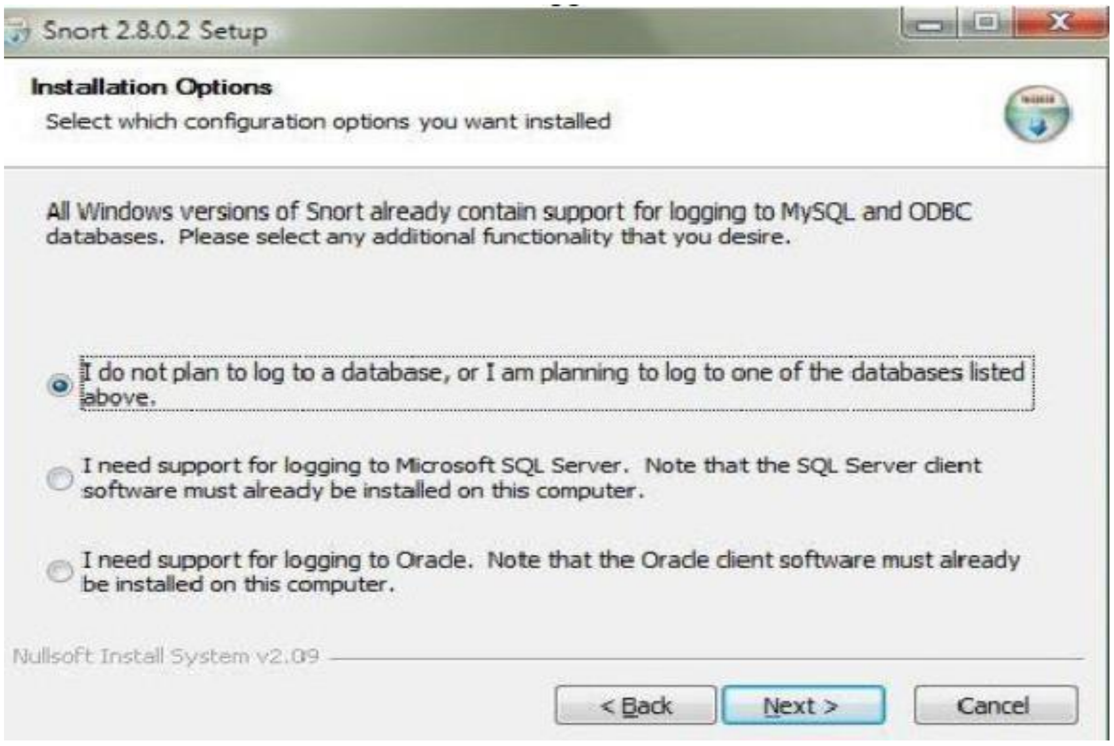
STEP-10: Skip the WinPcap driver installation.

STEP-11: Add the path variable in windows environment variable by selecting new classpath.

STEP-12: Create a path variable and point it at snort.exe variable name ☐ path and variable value ☐ c:\snort\bin.

STEP-13: Click OK button and then close all dialog boxes. Open command prompt and type the following commands:

INSTALLATION PROCESS :



Snort 2.8.0.2 Setup

Installation Options

Select which configuration options you want installed

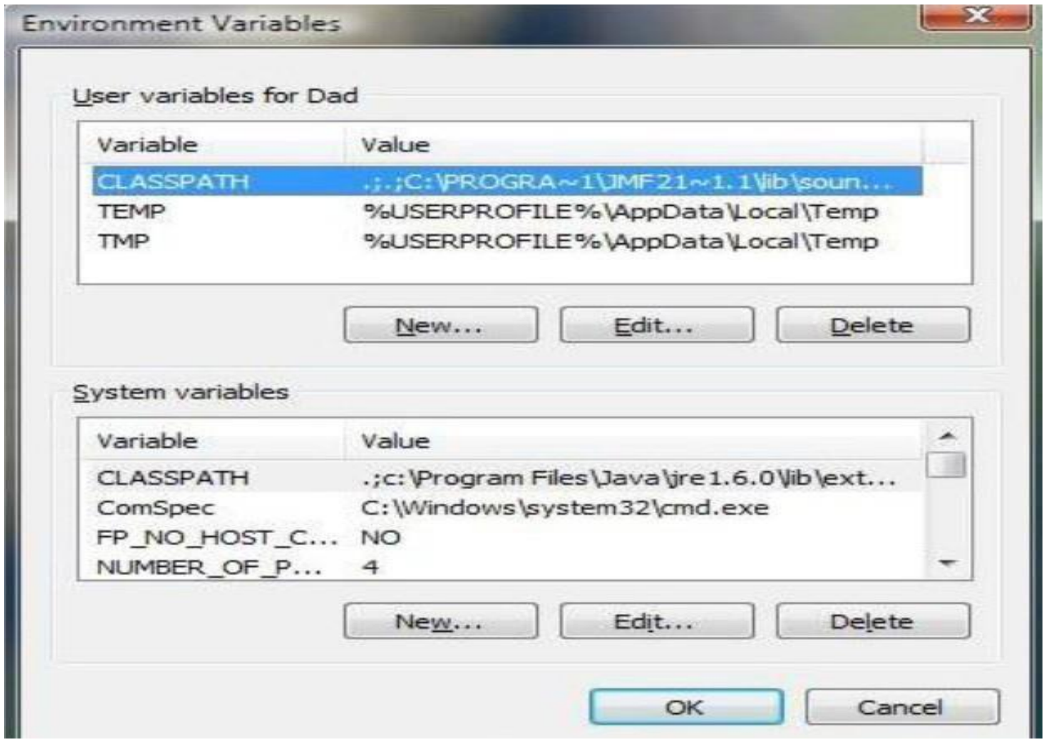
All Windows versions of Snort already contain support for logging to MySQL and ODBC databases. Please select any additional functionality that you desire.

[✓ I do not plan to log to a database, or I am planning to log to one of the databases listed above.]

I need support for logging to Microsoft SQL Server. Note that the SQL Server client software must already be installed on this computer.

I need support for logging to Oracle. Note that the Oracle client software must already be installed on this computer.

Nullsoft Install System v2.09



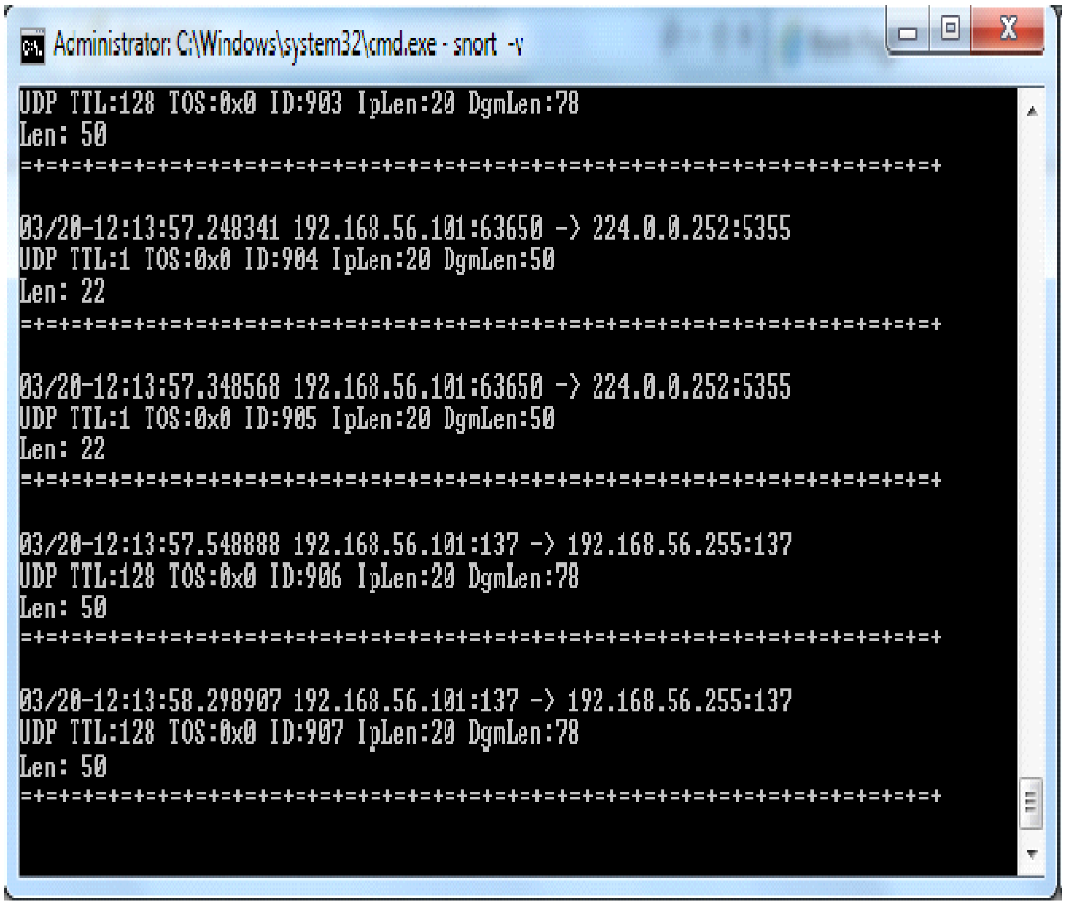
Environment Variables

User variables for Dad

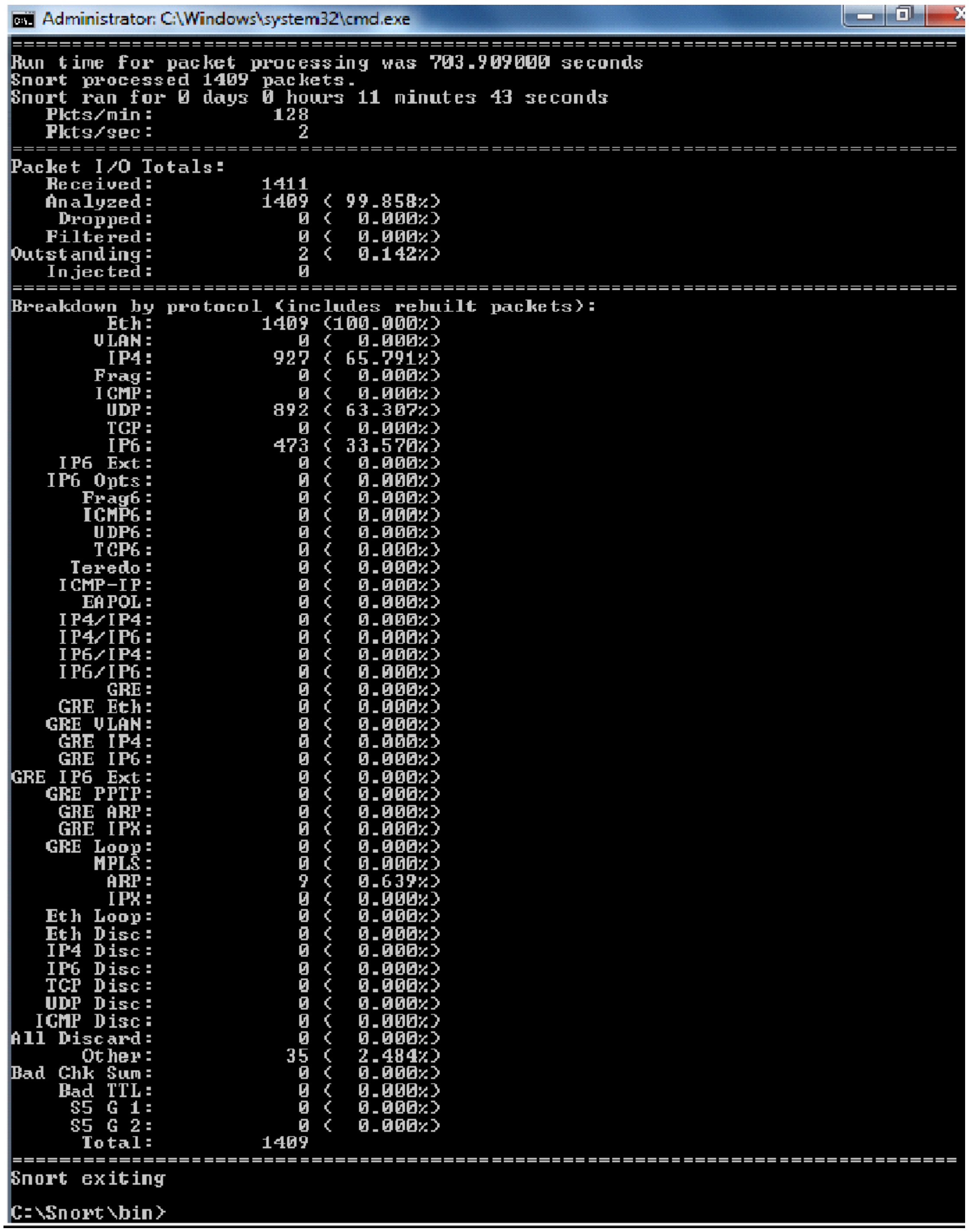
Variable	Value
CLASSPATH	.;.;C:\PROGRA~1\JMF21~1.1\lib\soun...
TEMP	%USERPROFILE%\AppData\Local\Temp
TMP	%USERPROFILE%\AppData\Local\Temp

System variables

Variable	Value
CLASSPATH	.;c:\Program Files\Java\jre1.6.0\lib\ext...
ComSpec	C:\Windows\system32\cmd.exe
FP_NO_HOST_C...	NO
NUMBER_OF_P...	4



```
UDP TTL:128 TOS:0x0 ID:903 IpLen:20 DgmLen:78
Len: 50
=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+

03/20-12:13:57.248341 192.168.56.101:63650 -> 224.0.0.252:5355
UDP TTL:1 TOS:0x0 ID:904 IpLen:20 DgmLen:50
Len: 22
=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+

03/20-12:13:57.348568 192.168.56.101:63650 -> 224.0.0.252:5355
UDP TTL:1 TOS:0x0 ID:905 IpLen:20 DgmLen:50
Len: 22
=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+

03/20-12:13:57.548888 192.168.56.101:137 -> 192.168.56.255:137
UDP TTL:128 TOS:0x0 ID:906 IpLen:20 DgmLen:78
Len: 50
=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+

03/20-12:13:58.298907 192.168.56.101:137 -> 192.168.56.255:137
UDP TTL:128 TOS:0x0 ID:907 IpLen:20 DgmLen:78
Len: 50
=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
```



```
===============================================================================
Run time for packet processing was 703.909000 seconds
Snort processed 1409 packets.
Snort ran for 0 days 0 hours 11 minutes 43 seconds
   Pkts/min:          128
   Pkts/sec:            2
===============================================================================
Packet I/O Totals:
   Received:         1411
   Analyzed:         1409 ( 99.858%)
    Dropped:            0 (  0.000%)
   Filtered:            0 (  0.000%)
Outstanding:            2 (  0.142%)
   Injected:            0
===============================================================================
Breakdown by protocol (includes rebuilt packets):
        Eth:         1409 (100.000%)
       VLAN:            0 (  0.000%)
        IP4:          927 ( 65.791%)
       Frag:            0 (  0.000%)
       ICMP:            0 (  0.000%)
        UDP:          892 ( 63.307%)
        TCP:            0 (  0.000%)
        IP6:          473 ( 33.570%)
    IP6 Ext:            0 (  0.000%)
   IP6 Opts:            0 (  0.000%)
      Frag6:            0 (  0.000%)
      ICMP6:            0 (  0.000%)
       UDP6:            0 (  0.000%)
       TCP6:            0 (  0.000%)
     Teredo:            0 (  0.000%)
    ICMP-IP:            0 (  0.000%)
      EAPOL:            0 (  0.000%)
    IP4/IP4:            0 (  0.000%)
    IP4/IP6:            0 (  0.000%)
    IP6/IP4:            0 (  0.000%)
    IP6/IP6:            0 (  0.000%)
        GRE:            0 (  0.000%)
    GRE Eth:            0 (  0.000%)
   GRE VLAN:            0 (  0.000%)
    GRE IP4:            0 (  0.000%)
    GRE IP6:            0 (  0.000%)
GRE IP6 Ext:            0 (  0.000%)
   GRE PPTP:            0 (  0.000%)
    GRE ARP:            0 (  0.000%)
    GRE IPX:            0 (  0.000%)
   GRE Loop:            0 (  0.000%)
       MPLS:            0 (  0.000%)
        ARP:            9 (  0.639%)
        IPX:            0 (  0.000%)
   Eth Loop:            0 (  0.000%)
   Eth Disc:            0 (  0.000%)
   IP4 Disc:            0 (  0.000%)
   IP6 Disc:            0 (  0.000%)
   TCP Disc:            0 (  0.000%)
   UDP Disc:            0 (  0.000%)
  ICMP Disc:            0 (  0.000%)
All Discard:            0 (  0.000%)
      Other:           35 (  2.484%)
Bad Chk Sum:            0 (  0.000%)
    Bad TTL:            0 (  0.000%)
     S5 G 1:            0 (  0.000%)
     S5 G 2:            0 (  0.000%)
      Total:         1409
===============================================================================
Snort exiting

C:\Snort\bin>
```

RESULT:

Thus the demonstration of the instruction detection using Snort tool was done successfully.