Cryptography And Network Security Lab

Assignment submission

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Batch: B5

Assignment: 11

Title of assignment: Implementation of Diffie – Hellman Key Exchange Method

Title:

Implementation of Diffie – Hellman Key Exchange Method

Aim:

To develop and implement the Diffie – Hellman Key Exchange Method

Theory:

- Diffie–Hellman key exchange is a method of securely exchanging cryptographic keys over a public channel and was one of the first public-key protocols as conceived by Ralph Merkle and named after Whitfield Diffie and Martin Hellman.
- The Diffie–Hellman key exchange method allows two parties that have no prior knowledge of each other to jointly establish a shared secret key over an insecure channel. This key can then be used to encrypt subsequent communications using a symmetric-key cipher.
- Although Diffie–Hellman key agreement itself is a non-authenticated key-agreement protocol, it provides the basis for a variety of

authenticated protocols, and is used to provide forward secrecy in Transport Layer Security's ephemeral modes.

Implementation of Diffie - Hellman Key Exchange Algorithm

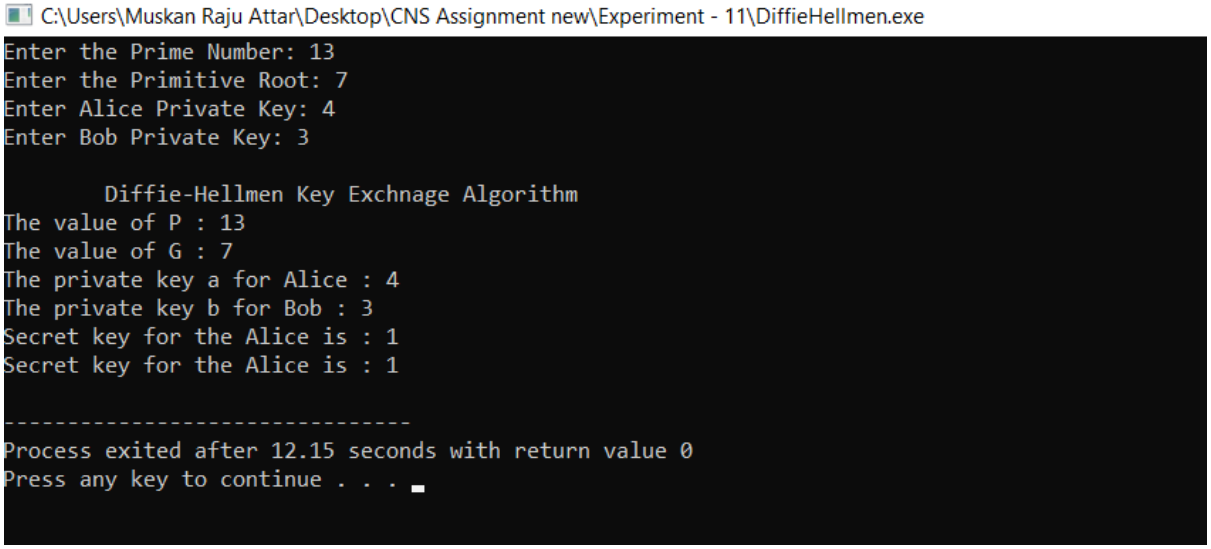
Code:

```
/* This program calculates the Key for two persons
using the Diffie-Hellman Key exchange algorithm using C++ */
#include <cmath>
#include <iostream>
using namespace std;

// Power function to return value of a ^ b mod P
long long int power(long long int a, long long int b,
                                    long long int P)
{
        if (b == 1)
                return a;

        else
                return (((long long int)pow(a, b)) % P);
}

// Driver program
int main()
{
        long long int P, G, x, a, y, b, ka, kb;

        // Both the persons will be agreed upon the
        // public keys G and P
        P = 23; // A prime number P is taken
        cout<<"Enter the Prime Number: ";
```

```
cin>>P;

G = 9; // A primitive root for P, G is taken'
cout<<"Enter the Primitive Root: ";
cin>>G;

// Alice will choose the private key a
a = 4; // a is the chosen private key
cout<<"Enter Alice Private Key: ";
cin>>a;

// Bob will choose the private key b
b = 3; // b is the chosen private key
cout<<"Enter Bob Private Key: ";
cin>>b;

cout<<"\n\tDiffie-Hellmen Key Exchnage Algorithm\t\n";

cout << "The value of P : " << P << endl;

cout << "The value of G : " << G << endl;

cout << "The private key a for Alice : " << a << endl;

x = power(G, a, P); // gets the generated key

cout << "The private key b for Bob : " << b << endl;

y = power(G, b, P); // gets the generated key

// Generating the secret key after the exchange
// of keys
ka = power(y, a, P); // Secret key for Alice
kb = power(x, b, P); // Secret key for Bob
cout << "Secret key for the Alice is : " << ka << endl;
```

```
    cout << "Secret key for the Alice is : " << kb << endl;

    return 0;
}
```

Output:



Conclusion:.

The Diffie - Hellman theorem can be used to get the primitive number of the large Prime numbers