Experiment No: 6

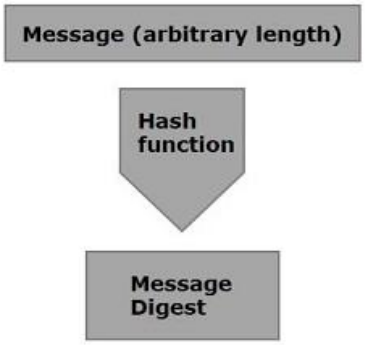
Title: Calculate the message digest of a text using the SHA-256 algorithm.

Aim: To develop a program for Calculate the message digest of a text using the SHA-256 algorithm using Java.

Theory:

Hash functions are extremely useful and appear in almost all information security applications. A hash function is a mathematical function that converts a numerical input value into another compressed numerical value. The input to the hash function is of arbitrary length but output is always of fixed length.

Values returned by a hash function are called message digest or simply **hash** values. The following picture illustrated hash function.



Java provides a class named **MessageDigest** which belongs to the package java.security. This class supports algorithms such as SHA-1, SHA 256, MD5 algorithms to convert an arbitrary length message to a message digest.

To convert a given message to a message digest, follow the steps given below –

Step 1: Create a MessageDigest object

The MessageDigest class provides a method named **getInstance()**. This method accepts a String variable specifying the name of the algorithm to be used and returns a MessageDigest object implementing the specified algorithm.

Create MessageDigest object using the **getInstance()** method as shown below.

MessageDigest md = MessageDigest.getInstance("SHA-256");

Step 2: Pass data to the created MessageDigest object

After creating the message digest object, you need to pass the message/data to it. You can do so using the **update()** method of the **MessageDigest** class, this method accepts a byte array representing the message and adds/passes it to the above created MessageDigest object.

md.update(msg.getBytes());

Step 3: Generate the message digest

You can generate the message digest using the **digest()** method od the MessageDigest class this method computes the hash function on the current object and returns the message digest in the form of byte array.

Generate the message digest using the digest method.

byte[] digest = md.digest();

Algorithm:

1. Read data from user.
2. Create the MessageDigest object.
3. Pass the data to created MessageDigest object.
4. Compute the message digest.
5. Convert the byte array in to HexString fromat.
6. Display the message digest.

Program:

```
import java.security.MessageDigest;
import java.util.Scanner;

public class MessageDigestExample {
```

```
    public static void main(String args[]) throws Exception{
      //Reading data from user
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter the message");
      String message = sc.nextLine();

      //Creating the MessageDigest object
      MessageDigest md = MessageDigest.getInstance("SHA-256");

      //Passing data to the created MessageDigest Object
      md.update(message.getBytes());

      //Compute the message digest
      byte[] digest = md.digest();
      System.out.println(digest);

      //Converting the byte array in to HexString format
      StringBuffer hexString = new StringBuffer();

      for (int i = 0;i<digest.length;i++) {
        hexString.append(Integer.toHexString(0xFF & digest[i]));
      }
      System.out.println("Hex format : " + hexString.toString());
    }
  }
```

Output:

```
Enter the message
Hello how are you
[B@55f96302
Hex format:
2953d33828c395aebe8225236ba4e23fa75e6f13bd881b9056a3295cbd64d3
```

Conclusion:

References:

1. William Stalling, “Cryptography and Network and Network security Principals and practices”,Pearson Education.
2. Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill.