Simplified Data Encryption Standard Key Generation

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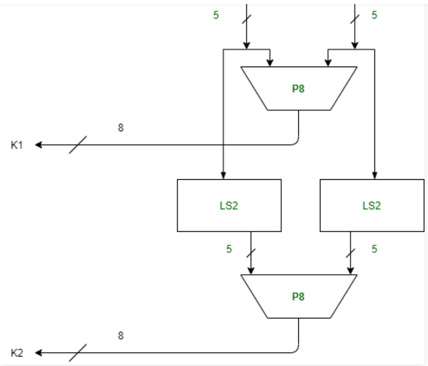
Simplified Data Encryption Standard (S-DES) is a simple version of the DES Algorithm. It is similar to the DES algorithm but is a smaller algorithm and has fewer parameters than DES. It was made for educational purposes so that understanding DES would become simpler. It is a block cipher that takes a block of plain text and converts it into ciphertext. It takes a block of 8 bit.

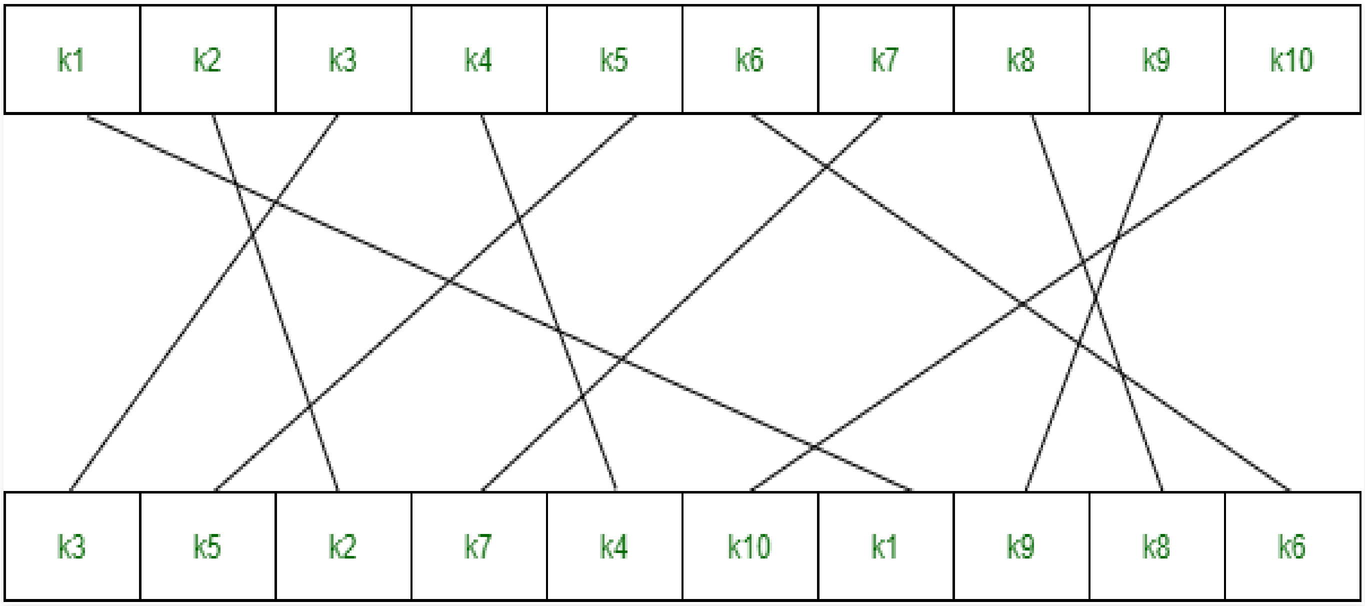
It is a symmetric key cipher i.e. they use the same key for both encryption and decryption. In this article, we are going to demonstrate key generation for s-des encryption and decryption algorithm. We take a random 10-bit key and produce two 8-bit keys which will be used for encryption and decryption.

Key Generation Concept: In the key generation algorithm, we accept the 10-bit key and convert it into two 8 bit keys. This key is shared between both sender and receiver.



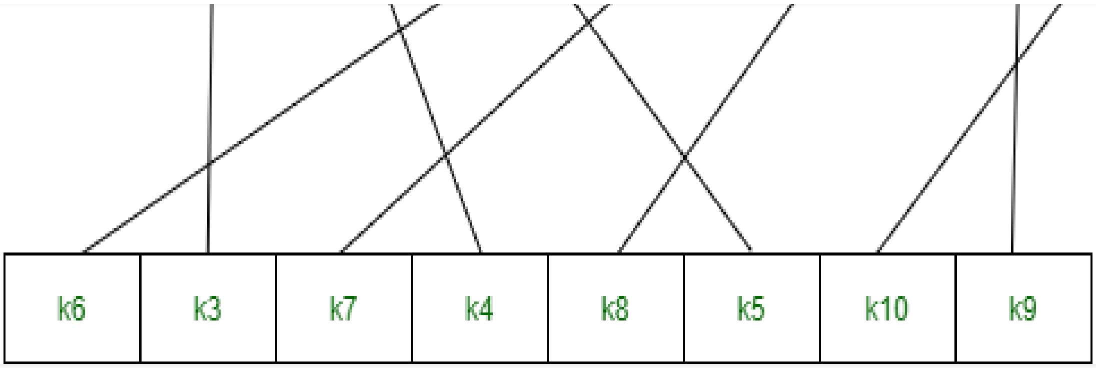
In the key generation, we use three functions:

1. Permutation P10

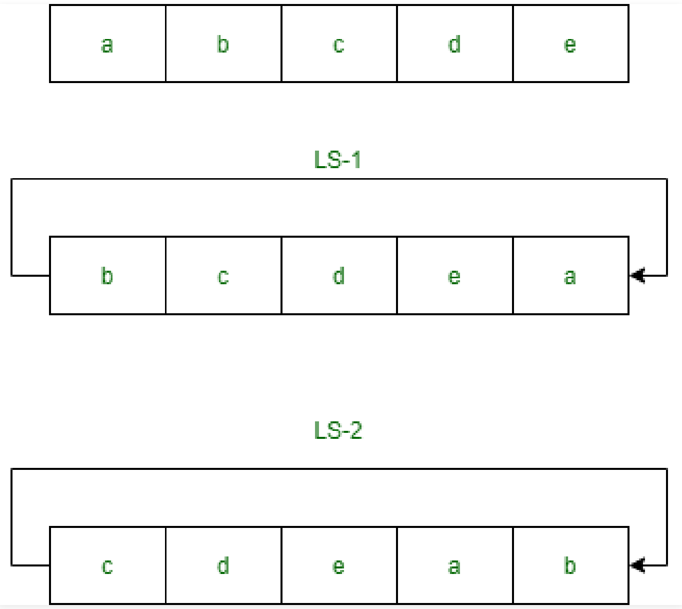


k1	k2	k3	k4	k5	k6	k7	k8	k9	k10
k3	k5	k2	k7	k4	k10	k1	k9	k8	k6

2. Permutation P8



3. Left Shift



Step 1: We accepted a 10-bit key and permuted the bits by putting them in the P10 table.

```
Key = 1 0 1 0 0 0 0 0 1 0
(k1, k2, k3, k4, k5, k6, k7, k8, k9, k10) = (1, 0, 1, 0, 0, 0, 0, 0, 1, 0)

P10 Permutation is: P10(k1, k2, k3, k4, k5, k6, k7, k8, k9, k10) = (k3, k5,
After P10, we get 1 0 0 0 0 0 1 1 0 0
```

Step 2: We divide the key into 2 halves of 5-bit each.

```
l = 0 0 0 0 1, r = 1 1 0 0 0
```

Step 4: Combine both keys after step 3 and permute the bits by putting them in the P8 table. The output of the given table is the first key K1.

```
After LS-1 combined, we get 0 0 0 0 1 1 1 0 0 0
P8 permutation is: P8(k1, k2, k3, k4, k5, k6, k7, k8, k9, k10) = (k6, k3, k
After P8, we get Key-1 : 1 0 1 0 0 1 0 0
```

Step 5: The output obtained from step 3 i.e. 2 halves after one bit left shift should again undergo the process of two-bit left shift.

```
Step 3 output - l = 0 0 0 0 1, r = 1 1 0 0 0
After two bit shift - l = 0 0 1 0 0, r = 0 0 0 1 1
```

Step 6: Combine the 2 halves obtained from step 5 and permute them by putting them in the P8 table. The output of the given table is the second key K2.

```
After LS-2 combined = 0 0 1 0 0 0 0 0 1 1
P8 permutation is: P8(k1, k2, k3, k4, k5, k6, k7, k8, k9, k10) = (k6, k3, k
After P8, we get Key-2 : 0 1 0 0 0 0 1 1
```

Final Output:

```
Key-1 is: 1 0 1 0 0 1 0 0
Key-2 is: 0 1 0 0 0 0 1 1
```

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