DES, or Data Encryption Standard, is a symmetric cryptosystem that uses a 64-bit block size and a 56-bit key for encryption. It operates as a 16-round Feistel cipher, where each round applies a series of operations to the input data based on the key.

Reason for Creation: The original DES with its 56-bit key was deemed vulnerable to modern technologies. To enhance security, Double DES and Triple DES were developed, using 112-bit and 168-bit keys, respectively.

Double DES:

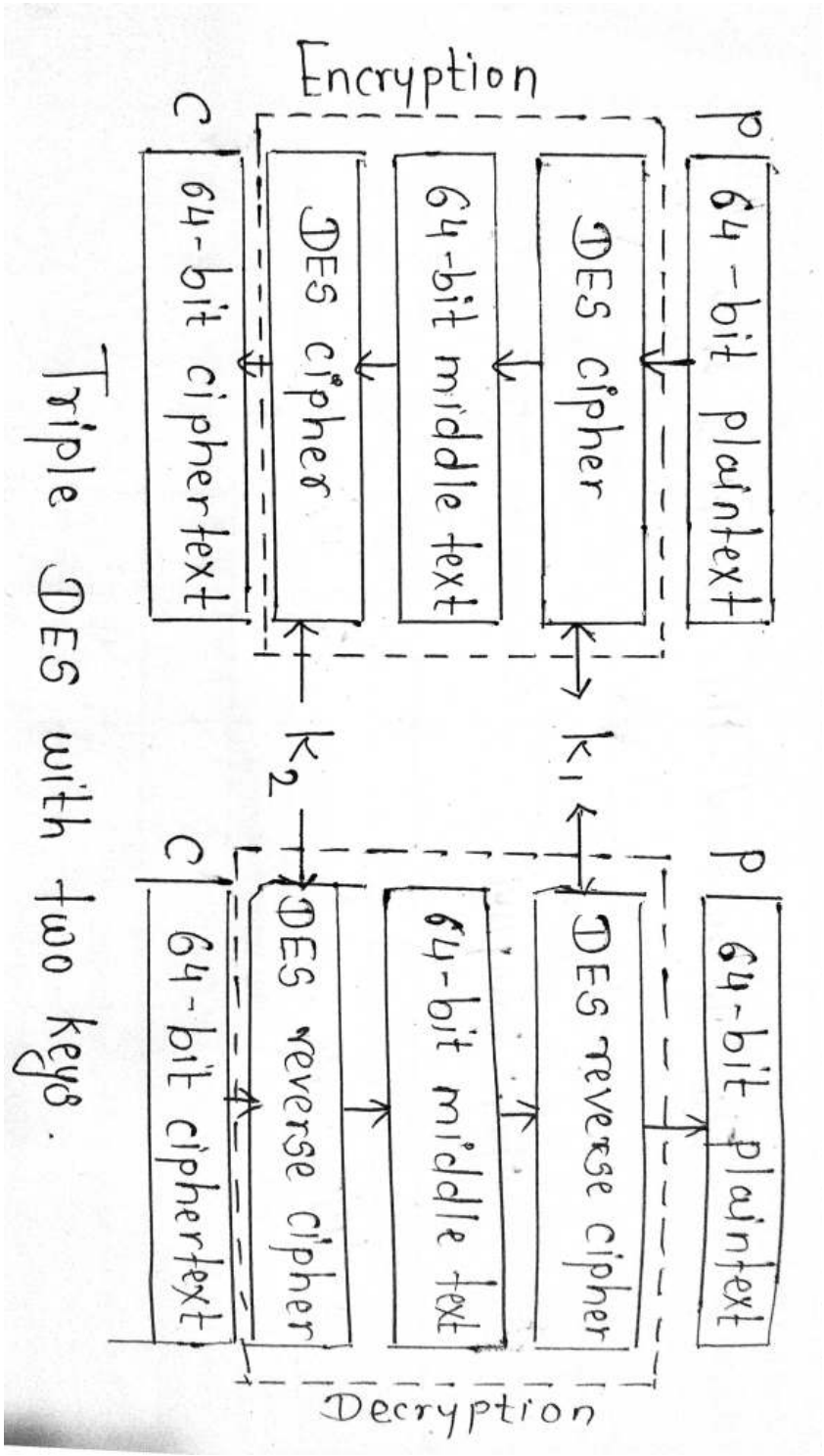
1. Process:
    - Double DES encrypts a plaintext using two instances of DES with different keys.
    - The 64-bit plaintext is input into the first DES instance, producing a middle text.
    - The middle text is then encrypted using the second DES instance, resulting in the final ciphertext.
2. Key Size Issue:
    - Despite using a 112-bit key, Double DES only provides a security level of 2^56 due to the vulnerability to a meet-in-the-middle attack.

Triple DES:

1. Process:
    - Triple DES enhances security by using three stages of DES for encryption and decryption.
    - Two versions exist: one with two keys and one with three keys.
2. Triple DES with Two Keys:
    - The first and third stages use the same key (K1), while the second stage uses a different key (K2).

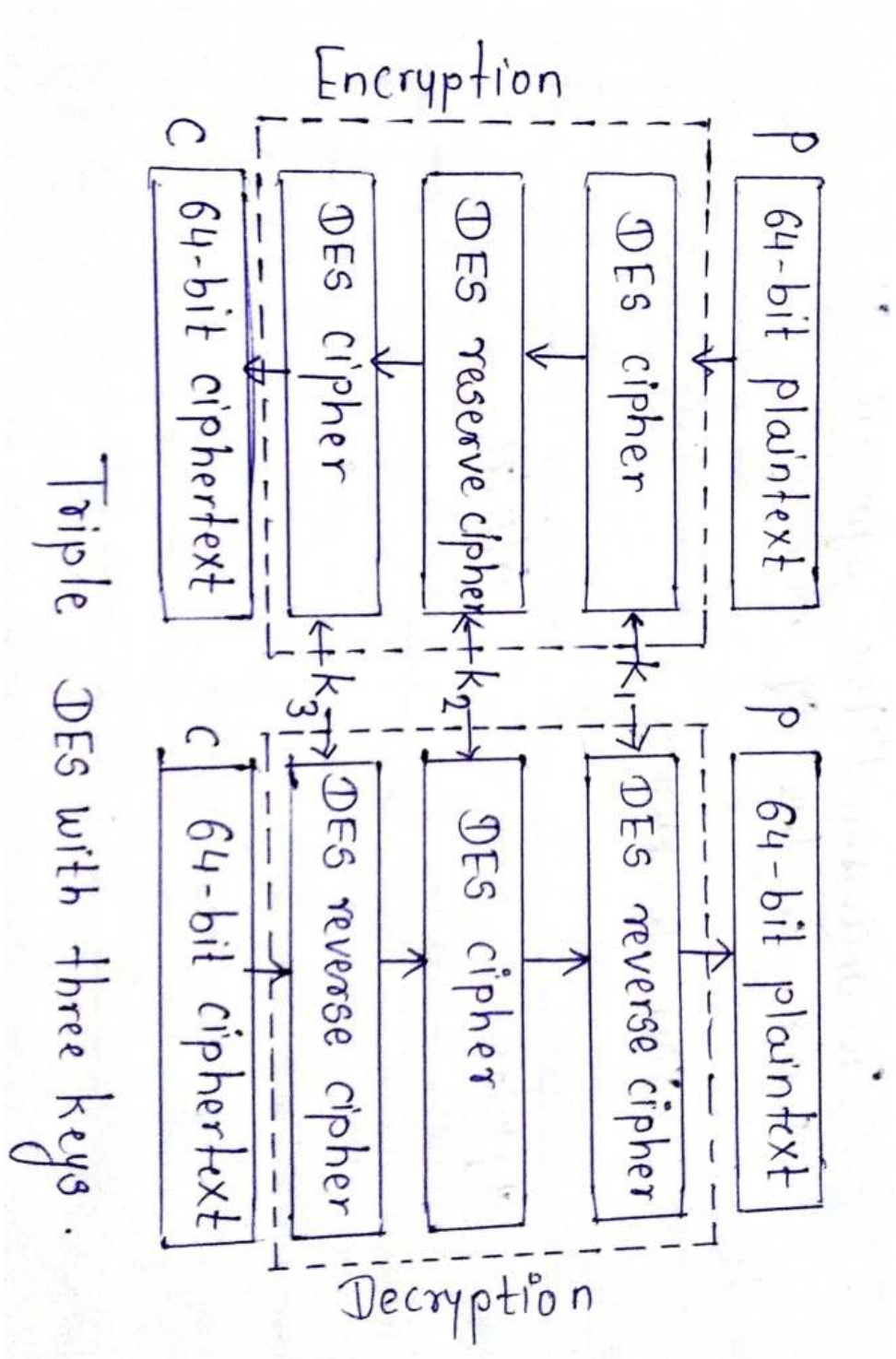
- The middle stage employs a decryption cipher in the encryption site and vice versa.

What is DES ? Why were double and triple DES created and what are they ?



1. Triple DES with Three Keys:
    - Encrypts the plaintext with three different keys (K1, K2, K3) in sequential stages.
    - This version is used in PGP and S/MIME for added security.

What is DES ? Why were double and triple DES created and what are they ?



Triple DES with three keys.

What is DES ? Why were double and triple DES created and what are they ?

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102. Explain real world protocols.
103. List the basic terminology used in cryptography.
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105. What is email security ?
106. What is an email certificate ?
107. What is Transport Layer Security (TLS) ?
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142. What is packet filtering firewall ? Explain its advantage and disadvantage.