Sms Encryption Application Using 3Des (Triple Data Encryption Standard) Algorithm Based on Android

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Abstract. Security is an important aspect in communicating using information technology. SMS is a service provided by mobile phones to communicate by sending short messages quickly and cheaply. Short message delivery is done by SMS network, so the messages are not sent directly to the destination mobile phone. Therefore the messages that are sending by the SMS service need to be protected, so the security of the messages sent to the SMS network remains protected by its confidentiality. In this study the software will be built to improve the security of messages on SMS communication. The software that is built serves to encrypt messages that will be sent and decrypt messages with entered through the SMS service. Software built using the 3DES (Triple Data Encryption Standard) algorithm. The 3DES algorithm is a flow algorithm (block cipher) which belongs to the type of symmetry key cryptography system. The implementation of the 3DES algorithm on software that is built using the Java-based programming language Java. So only software that uses the Android operating system can use this encryption and decryption application.
1. Introduction
Along with the times, human needs for information and communication technology also increased. One of the communication device technologies is a mobile phone or known as a cellular phone. Mobile phone is a primary need for people who need information and communication throughout the world. In Indonesia, mobile phone is commonly used, the users are from all of ages. Mobile phone has standard voice communication facilities, namely telephone and SMS (Short Message Services). In everyday life, SMS facilities are the choice of many people to communicate because it is relatively cheap, easy, clear and fast [1].

The messages sent are stored first in the SMSC (Short Message Service Center). This is an advantage of the SMS service that can still send messages even though the destination mobile phone is busy. But it is also becomes a security gap for SMS services. This is due to the attacker can infiltrate the SMSC to get messages stored in the SMSC before being sent to the destination of mobile phone.

This is very important to note when mobile phone users want to send important and confidential messages. To reduce the risk of the security gap, one method that can be applied is to use cryptographic techniques or encrypt the sent messages. Although, even if the attacker manages to infiltrate the SMSC and get a message, it will be difficult to find out the contents of the encrypted message [2].

One of cryptographic method is 3Des (Triple Data Encryption Standard), 3DES is an enhanced and far more complicated version of DES achieving a high level of security by encrypting data using DES three times using three different DES keys [3].

2. Related Works
The DES algorithm is the most widely used encryption algorithm in the world adopted by NIST (National Institute of Standards and Technology) as the US Federal information processing standard. The plaintext data is encrypted in 64-bit blocks into 64-bit ciphertext data using an internal key 56 key. DES transforms 64-bit input in several stages of encryption into 64-bit output. Thus, DES includes block ciphers. With the same stages and keys, DES is used to reverse encryption. The internal key in the DES algorithm is generated from a 64-bit external key [4].

3. Research Methodology
3.1 System Design
At this stage the author designs an application / program. The author designs an SMS text encryption program to assist the users send secret messages, using Android-based Java programming language[5]. The first step in designing this program is to design a system work process using a scheme that explains in detail the processes that will be carried out by the program until text text encryption can be run. Next designing the form of program display (User Interface).

3.2 System Implementation
System implementation is the final stage in the process of creating this application. At this stage the author does running or testing the program in advance of the application that has been made. The program test aims to anticipate errors so that errors can be corrected immediately before they are implemented. After there are no more errors, then this system can be directly implemented to system users [6].

3.3 Network System Scheme
The SMS encryption network system scheme built in this study is illustrated in Figure 1 [7].
Figure 1. Encryption Process on SMS

Based on the picture above, the encryption application system can be described as follows:

a. The application is installed on both mobile phone and run first then type the message in the available textbook, the message is encrypted and the user can continue the process of sending messages.

b. The message is sent to the SMSC via the GSM network by passing several Base Transceiver Station (BTS) first (the message is not directly sent to the recipient's mobile phone, but through the SMSC first).

c. In the previous BTS (closest to the SMSC) the message is sent to the SMSC via a cable network. In this SMSC messages that have been encrypted are temporarily stored for information needs such as delivery reports, pending or failed status.

d. Then it is forwarded by one BTS to another BTS to the BTS that serves the recipient's mobile phone network.

e. When a message is sent to the sender's mobile phone application, the recipient's mobile phone will know that there is an incoming message on the specified port, then displays the results to the user that there is a message.

f. The recipient who approves the read message then the system performs the decryption process on the message and displays the results to the user.

4. Result and Discussion

4.1 System Analysis

In a computer-based system design process, problem analysis plays an important role in making detailed applications that will be developed, problem analysis is a step to understanding the problem before taking an action or final settlement decisions. System analysis aims to identify the problems that exist in the system, where the applications built include the operating environment, user and related elements. This analysis is the basis for the stages of system design, which includes selecting a sample, determining the mobile phone can support in running the application to be built and determining the binary code summarized in the number of characters that will make the sample in the system testing, and the measurement of time during the encryption process and description of data on the system.

4.2 System Design

In designing this application there are two dominant processes that apply in this system, namely encryption and decryption. In the encryption process, the data in the text input SMS form will be changed by the algorithm 3 Des (Triple Data Encryption Standard) cryptography which produces
chipertext in hexadecimal form. Next, the decryption process will be carried out, which is to return the chipertext in the hexadecimal form to the plantext return.

The design aims to provide an overview of the system will be built and understand the flow of processes in the system. The design will begin after the system analysis phase has been completed. Design can be defined as depiction. Started with the entry of users into the application and immediately enter the main menu, if you want to encrypt text sms, users can directly select the menu available in the main menu, such as the SMS encryption menu. If the user wants to decrypt SMS text, the user can directly select the SMS decryption menu.

Activity Diagram focuses on describing the sequence of activities in a process. This Activity Diagram has a diagram structure similar to a flowchart or data flow diagram in a structured design, and is useful to help understand the overall process. The following Activity Diagram for SMS encryption application.

| User | System |
|------|--------|
| ![Activity Diagram](Figure 2. Activity on Encryption Diagram) |

From Figure 2 above it can be seen that the user is doing the encryption process. In this process the user must input the message to be encrypted then the user inputs the external key then the user chooses the encryption button then the system will respond by displaying the chipertext on the edittext provided.

| Table 1. Message Encryption Specifications |
|---------------------------------------------|
| **Use Case** | Encryption the message |
| **Actors** | User |
| **Descriptions** | This Use Case describes the process of encrypting ordinary messages |
4.3 How the DES Algorithm Works (Data Encryption Standard)
The steps to encrypt data using the DES (Data Encryption System) algorithm are:
Plaintext (ptx) = 1q2w3e4r
Key (k) = /,.mnbvc
First Step:
Change (ptx) and (k) into binary form:
Binary (ptx) = 00110001 01110001 00110010 01110111 00110011 01100101
00110100 01110010
Biner (k) = 00101111 00101110 00101100 01101101 01101110 01100010
01110110 01100011
Second Step:
Performs Initial Permutation (IP) in the plaintext bit using the following IP table:

| Table 2. Table of Initial Permutation (IP) |
|------------------------------------------|
| 58 50 42 34 26 18 10 2 |
| 60 52 44 36 28 20 12 4 |
| 62 54 46 38 30 22 14 6 |
| 64 56 48 40 32 24 16 8 |
| 57 49 41 33 25 17 9 1 |
| 59 51 43 35 27 19 11 3 |
| 61 53 45 37 29 21 13 5 |
| 63 55 47 39 31 23 15 7 |

The sequence of bits in the 58th plaintext is placed in position 1,
The sequence of bits in plaintext in the 50th order is placed in position 2,
The sequence of bits in the 42nd plaintext is placed in position 3, etc.

Furthermore, due to this application using 3 key (key) or 3DES algorithm, it must doing by the internal key generation process again with:
Key (k)2 = 12345678
Key (k)3 = qwertyui
Then doing the DES algorithm again as above with the second and third keys. Then the last result will produce ciphertext in hexa form, like: ceb25f256ad6e9e.

5. Conclusion
The conclusions obtained from this study are as follows:
1. The process of text encryption and decryption with the 3DES (Triple Data Encryption Standard) algorithm was done by implementing the DES algorithm three times.
2. With the cryptographic application developed based on the 3DES (Triple Data Encryption Standard) algorithm, the important data can be secured (encrypted) when sending by SMS.
3. Encrypted messages cannot be understood if they are not decrypted using the correct key. So that only eligible recipients can read it.
4. The results of this study are creating an SMS application on an Android-based Smartphone that can send and receive text messages.

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