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A Secure Protocol For End To End Security To SMS Banking

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Abstract*— *Short Message Service (SMS) is a very popular and easy-to-use communication medium for mobile phone users. Using SMS mobile user send some confidential information such as password , account number , banking information in the form of text message from one mobile to another mobile,. The information send in plaintext format the hacker easily read this information and privacy will not be maintained. Nowadays SMS is used for many value added services as mobile banking and e-commerce but due to lack of security this application rarely used. For this purpose we provide a solution that provides end to end security of the message with authentication, confidentiality, integrity. Hence we present a secure model for SMS mobile banking services tailored to suit mobile cellular phone users.

Keywords*—*Authentication,SMS ,Mobile banking ,Security.

Introduction

Short message service (SMS) has become a very strong communication medium of transferring the information worldwide. On December 3, 2014, SMS service has completed its 22 years as on December 3, 1992, the world's first SMS was sent by Neil Papworth from the UK through the Vodafone network. The popularity of SMS is increasing day by day as it is being used in many data centric applications including railways enquiry, news alert, mobile banking, health care applications. User send confidential information using SMS.

SMS channel is not secure to transfer confidential information SMS are send from base station to mobile station in encrypted format then the message store in SMS center .The SMS center check the recipient in home location register(HLR) or visitor location register(VLR) and message to specific recipient. the message store in SMS center that message are read by network operator hence privacy will not be maintain

Mobile banking system is one which provides all daily banking operations to customer with one click of his mobile handset with supported application. M-banking system has potential to provide access or delivery of very specific and highly necessary information to customer . Growth in the M-Banking is driven by various facilities like convenience of banking operations, greater reach to consumers and Integration of other m-commerce services with mobile banking. In M-banking there is no place restriction, it is highly penetration coefficient as growth of mobile phones are more than computers, it is fully personalized and private increasing transaction authenticity and is available all time to the user

The contents of SMS are stored in SMS center and it is visible to the network provider Staff it can modify he contain of the message and therefore, SMS is not an appropriate communication medium for secure communications. Most users do not realize how easy to hack the SMS message. An hacker can easily hack the SMS center and read the message contain.
SMS security has at least four security constraint to meet, as listed below:

In confidentiality it prevents the unauthorized user to assess the private information. The encryption techniques are used to provide confidentiality to the message.

In integrity it is preventing anybody other that authorized parties from modifying the computer system assets like writing, changing status and deleting and creating files. the methods of attacking integrity we found replay , reordering and modification of messages.

In non-repudiation it provides security service that prevent participant from denial of message transmission service. The message can send by sender to the receiver. The receiver can prove the message coming from authorized sender. The most common technique used in non-repudiation is digital signature method.

In authentication it gives assurance to the communication party that it claims to be. For authentication purpose both communication party knows the common factor that authenticate the user.

Literature survey

Various author suggesting various technique to provide end to end security to the SMS .the author provide framework and protocol that provide security to the SMS .The Survey is base on which technique is used to provide security to the SMS.

Neetesh Saxena,Narendra S. Chaudhary[1]It propose a protocol that improve the authentication technique. In this it provide a technique that authenticate the user and provide end to end security .this protocol prevent various attack like Man-in middle, SMS Spoofing, Replay attack, SMS disclosure.

Geovandro C.C.Pereira[2]In this paper it proposed a framework for secure SMS transmission. SMSCrypto encloses a tailored selection of lightweight cryptographic algorithms and protocols, providing encryption, authentication and signature services. For confidential purpose it used public key cryptography and for authentication purpose it use block cipher based Message Authentication Code (MAC) for generating a message and key-dependent tag appended to each SMS message

Lokesh Giripunje[3] In this paper it proposed a framework for providing end-to-end security for transmission of SMS . In this framework it used existing GSM encryption algorithm A8 for maintaining confidentiality

Mohsen Toorani, Ali Asghar Beheshti Shirazi[4]The main contribution of this paper is to introduce a new secure application layer protocol, called SSMS, to efficiently embed the desired security attributes in the SMS messages to be used as a secure bearer in the m-payment systems. SSMS efficiently embeds the confidentiality, integrity, authentication, and non repudiation in the SMS messages

Johnny Li-Chang Lo[5]In this paper it proposed a protocol SMSSec that can be used to secure a SMS communication sent by Javas Wireless Messaging API. SMSSec has a two-phase protocol with the 1st handshake using asymmetric cryptography which occurs only once, and a more efficient symmetric nth handshake which is used more dominantly protocols is the ability to perform the secure transmission with limited size messages

Hao Zhao, Sead Muftic [6] implemented a new secure mobile wallet application using J2ME for convenience and security of financial mobile transactions performed by the subscribers. AES and DES are used as an encryption methods and SHA-1,2 are used to generate hashes/keys for authentication purpose. Separate authentication module, i.e., PIV is implemented as a separate java card applet to provide authentication service to all subscribers

Harb [7] has used symmetric and asymmetric cryptography to develop secure mobile payment application model. It is suitable for online payment/ transactions; provides security with minimum cryptography keys and less encryption operations. SMS is used as a transport channel in order to send transactions to payer. 3DES session key is used to secure SMS communication b/w customer and bank. J2ME application generates encrypted SMS having payers confirmation and sends it to payers bank. Payers bank will decrypt SMS and send payees mobile number to PG.

Hassan Mathkour [8] proposed a new system, i.e., Secret Short Message Service (SSMS) to secure SMS messages transmission on mobile network. Their system can also protect the private data saved on mobile phone. AESRijndeal is used to perform encryption. Secret key is embedded in cipher text using hash. It is used to encrypt SMS message. Message decryption also uses the same secret key. Encrypted secret key is used for encryption and decryption. Bouncy-Castle J2ME cryptographic library is used for encryption with SHA-1

Neetesh Saxena [9] proposed a new approach to provide SMS security using encryption and digital signatures. Firstly, message is encrypted then digital signature is applied on the encrypted message. DES, AES, DSA, and RSA are used respectively in order to encrypt SMS message. Signature generation uses hash function to get message digest. DSA signature method is used to verify signatures. DES, Triple-DES, AES and Blowfish algorithms are implemented and AES is found to take less encryption/decryption time.

Marko Hassinen [10] has used RSA algorithm to encrypt SMS messages used in mobile commerce, whereas keys are generated using SHA-1. Private keys are restricted to mobile devices. Authentication Server will then generate certificates for public keys. Lightweight Directory Access Protocol (LDAP) database is used to store/retrieve those certificates. These certificates are further used by mobile user to exchange encrypted SMS messages

David Lisonk [11] proposed an application to encrypt SMS messages using asymmetric RSA cipher. OAEP padding scheme is used to avoid RSA from dictionary attacks. Private keys are stored in the application, whereas public keys are stored in mobile memory. Symbian OS is used as a programming environment since it requires less computational power. Key generation operation is tested on Nokia N80 by subtracting the actual start time of key generation from its final time. Analysis of several attacks on application is also conducted at the end.

Alfredo De Santis [12] proposed a secure extensible and efficient SMS (SEESMS) application framework which allows two mobile peers to exchange encrypted SMS message in an efficient manner by selecting their level of security. ECIES and RSA are used for encryption. RSA, DSA, and ECDSA signatures are also used to validate contacts. After being registered with SEESMS on mobile, keys are exchanged b/w users to transmit secure SMS using HMAC. Users will then select energy efficient cryptosystem, encrypt SMS using it, and send to the receiver. Comparison of RSA, DSA, and ECDSA is conducted on the basis of energy efficiency on N95 mobile. RSA and DSA

Proposed work

In proposed solution we provide a framework for secure end to end mobile banking. For this purpose we used symmetric encryption algorithm for encryption purpose we used MAES encryption algorithm. To make mobile banking first mobile user registers their mobile number to the respected bank. Bank verifies the detail of customer and to save the mobile number in the bank database and gives secure key to the customer in the format of SMS or in the letter or mail secure key to the respected customer email id. These secure key is stored in encrypted format in the database. Bank provide mobile application that is install in mobile handset for secure mobile banking that encrypt and decrypt the message and provide end to end security of message . The Secure message contain mobile id, MAC, encrypted message and transaction time .the client send its mobile id, MAC1 ,encrypted message will be

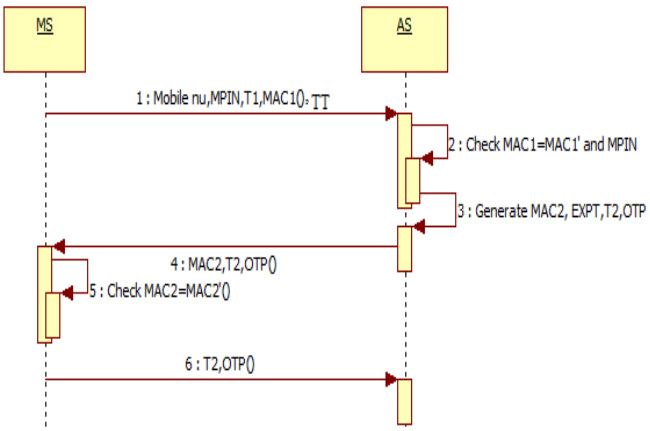

Fig: Proposed Protocol

Generated using modified AES symmetric encryption algorithm and transaction time is at the time request will be generated these all contain are send to the bank server. Server decrypt the message and calculate MAC1' and check MAC1'=MAC1 and check mobile id if it is correct then it generate one time password (OTP) encrypted using MAES algorithm. These OTP are stored into the database .The server send MAC2, E (OTP), and transaction time all these contain are send to the client. Client calculate MAC2' and check MAC2'=MAC2 if it is found correct then it send back replay with OTP and transaction time to the server. Server check the OTP with stored OTP if it is found correct then authentication of client is successful.

There are four main security constraints that can be maintained by any framework or protocol. The four constraints are confidentiality, integrity, non-repudiation, and authentication. The proposed solution will be maintain all the four security constraint confidentiality of the SMS will be maintain using symmetric encryption algorithm and integrity will be maintain using hash algorithm i.e. MAC that can check hash function and will be maintain integrity of the message. Non-repudiation will be maintain using one time password and Authentication will be done using various authentication pattern like account number, Secret key and one time password.

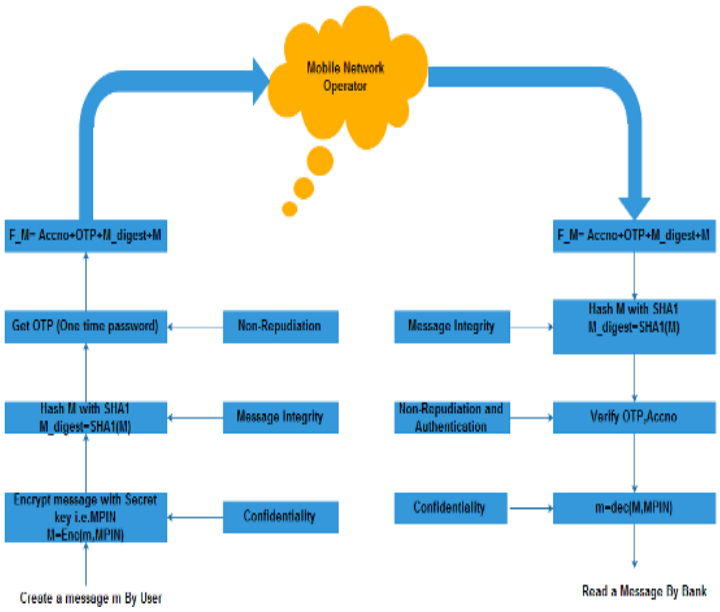

Fig Security Service

IV Implementation

We have implemented proposed solution in java and android platform. At the server side we used java platform and for data storage we used oracle 11g and at the client side we developed an android application that can install in the client mobile that application run in android supported handset. An application can provide security to the SMS banking that can maintain integrity, authentication, non-repudiation and confidentiality.

MATHEMATICAL MODEL

1. Check Balance:

Let,

Esk = encryption with the secure key

EAccP = encryption using secret key

H = A hashing function that generates a digest on message m1

Ci = the Cipher text

Transaction Type = The number specifying the transaction selected.

Accno = Account identifier of the user

PIN = user predefined personal identification number.

m1 and m2 = Plaintext Message.

Then,

M1 = Esk[m1 + PIN]

M2 = H[m1 + PIN]

M3 = Accno||Transaction Type||M1||M2

M4 = EAccP[< confirmation >]or[< Error message >]in ciphertext

Where,

Output M3 Send from Customer to server.

Output M4 send response from bank server to customer.

2. Money Transfer

M1 = Esk[m2 + PIN]

M2 = H[m2 + PIN]

M3 = Accno||DestinationAccID||Transaction Type||M1||M2

M4 = EAccP[< confirmation >]or[< Errormessage >]inciphertext

where,

Output M3 Send from Customer to server.

Output M4 send response from bank server to customer.

CONCLUSION AND FUTURE WORK

We have implemented a framework that provides secure mobile transaction using mobile banking application. All messages are sent from customer in encrypted format, bank decrypt the message and process the query and send response in encrypted format to the mobile .user decrypt this message using the banking application install in mobile. In the future work we analyze the encryption algorithm which is better than AES, we can use concept of SIM application toolkit where bank store application and encryption key on SIM.

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