Secure File Storage on Cloud using Hybrid Cryptography

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Abstract - **Cloud Computing has played a vital role in the field of computing. It has revolutionized how computing is used in the industry from first setting up the infrastructure and then using it to just spinning up the resources as needed from different cloud vendors. It is also used in different industries for various services and storage of data. The data stored on the cloud can be retrieved as per the user's request but the concern of many users is the security of their data. In this proposed system 3DES (Triple Data Encryption Standard) and Blowfish algorithms are used to provide security. Here the encryption is divided into three parts. Each part is encrypted with different encryption algorithms and decrypted using the different keys when required. This system of encryption and decryption guarantees better security of data to the users by storing encrypted data on a single cloud server, using 3DES and Blowfish.**

Keywords: Blowfish, 3DES, Secure, File Storage, Cloud, Hybrid Cryptography.

1. Introduction

In Cloud computing, both files and software are not fully contained on the user's computer. File security concerns arise because both user's application and program are residing in provider premises. The cloud provider can solve this problem by encrypting the files by using encryption algorithm. Our project idea presents a file security model to provide an efficient solution for the basic problem of security in cloud environment. In this model, hybrid encryption is used where files are encrypted by blowfish coupled with file splitting and AES is used for the secured communication between users and the servers.

Cloud computing is originated from earlier large- scale distributed computing technology. NIST defines cloud computing as a model for enabling convenient on demand network access to a shared pool of configurable computing resources (like network, storage, application and services) that can be quickly provisioned and released with minimal management effort or service provider interaction. In Cloud computing files and software are not fully contained on the user's application and Program are residing in provider premises. The cloud provider can solve this problem by encryption the files by using encryption algorithm. This paper presents a file security model to provide an efficient solution for the basic problem of security in cloud environment. In this model, hybrid encryption is used where files are encrypted by file splitting and RSA is used for the secured communication between users and the servers.

2. Methodology

1) The proposed software product is liable to meet the required security needs of data center of cloud. Blowfish used for the encryption of file slices takes minimum time and has maximum throughput for encryption and decryption from other symmetric algorithms.

2) The idea of splitting and merging adds on to meet the principle of data security. The hybrid approach when deployed in cloud environment makes the remote server more secure and thus, helps the cloud providers to fetch more trust of their users.

3) Data security issues: Due to openness and multi-tenant characteristics of the cloud, the traditional security mechanisms are no longer suitable for application and data in cloud. Some of the issues are as following: Due to dynamic scalability, service and location transparency features of cloud computing model, all kinds of application and data of the cloud platform have no fixed infrastructure and security boundaries. In the event of security breach, it is difficult to isolate a particular resource that has been compromised. According to service delivery models of cloud computing, resources and cloud services may be owned by multiple providers. As there is a conflict of interest, it is difficult to deploy a unified security measure. Due to the openness of cloud and sharing virtualized resources by multitenant, user data may be accessed by other unauthorized users.

4) Hybrid Cryptosystem Scheme: Hybrid Cryptography concept is used for securing storage system of cloud. Two different approaches are used to show the difference between less secure and more secure systems. The first approach uses RSA and AES algorithms; RSA is used for key encryption and AES is used for text or data encryption. In the second or we can say more secured approach, AES and Blowfish algorithms are used. In this

approach, these two algorithms provide double encryption over data and key which provides high security compared to the first one. I. In this proposed system three step procedures is used. Firstly, Diffie Hellman is used for exchanging keys. Thereafter authentication is performed using digital signature scheme. Finally, data is encrypted using AES and then uploaded to the required cloud system. For decryption reverse procedure is implemented. II. Combination of RSA algorithm and MD5 to assure various security measures such as confidentiality, data integrity, no repudiation etc. It uses RSA key generation algorithm for generation of encrypted key for encryption and decryption process. MD5 digest is used for accepting an input of length up to 128 bit and processing it and generating an output of padded length for encryption and decryption process. III. Implementation of Trusted Storage System using Encrypted File System (EFS) and NTFS file system drive with help of cache manager for securing data files. EFS encrypt stored files by automatically using cryptographic systems. The process takes place as follows, firstly application writes files to NTFS which in turn places in cache and return backs to NTFS. After this NTFS asks EFS to encrypt files and heads them towards the disk. IV. Cloud Storage Security Service is provided by using separate servers' viz. User Input, Data Storage and User Output. Three different servers are used to ensure that failure of any of the servers doesn't harm the data. User Input server is used for storing user files and input data by providing user authentication and making sure the data is not accessed by any of the unauthorized means. Data storage server is the place where the encryption using AES is performed to secure user input and then the encrypted files are transferred to User Output server. User Output Server is the place from where user gets the output file or the decrypted file and uses it for further use.

5) Blowfish: Blowfish is a symmetric block cipher which uses a Fiestal network, 16 rounds of iterative encryption and decryption functional design. The block size used is of 64-bits and key size can vary from any length to 448.Blowfish cipher uses 18 sub arrays each of 32- bit commonly known as P-boxes and four Substitution boxes each of 32-bit, each having 256 entries. The algorithm design is shown in figure. It consists of two phases: one is Key Expansion phase another is Data Encryption phase. In Key expansion phase, key is converted into several sub-keys and in Data Encryption phase, encryption occurs via 16- round networks. Each round consists of a key dependent permutation and a key and data dependent substitution.

6) Advanced Encryption Standard (AES) The AES algorithm is related to Rijndael's encryption. Rijndael is a family of encryption algorithms with different keys and block sizes. It consists of a continue serial operations, some of them involve the input of certain outputs (substitutions) and others the mixing of bits (permutations). All AES calculations algorithm is executed in bytes instead of bits. Therefore, for Advanced Encryption Standard, 128 bits of plain data is considered as a block of 16 bytes These 16 bytes are arranged in a 4x4 matrix for the processing.

3. Module Description

In order to ensure file security on cloud, hybrid cryptosystem is being used. We assume that the remote server is trusted, so files are encrypted by server and finally encrypted files are stored at the server end. The hybrid cryptosystem uses a combination of:

- Blowfish Algorithm coupled with File Splitting and Merging mechanism
- AES Algorithm

In a hybrid scheme, the performance of symmetric algorithm is integrated with security of asymmetric algorithm. The symmetric algorithm (Blowfish) used in hybrid cryptosystem has best practice to avoid data misuse when compared with other symmetric algorithms. Also, in terms of throughput, Blowfish has best performance.

4. Problem Statement

The main aim of this system is to securely store and retrieve data on the cloud that is only controlled by the owner of the data. Cloud storage issues of data security which we can solve using cryptography and steganography techniques. Data security is achieved using Blowfish and AES algorithm.

5. Literature Survey

[1]. To make the centralised cloud storage secure ECC (Elliptic Curve Cryptography) algorithm is implemented. This approach uses single key for encryption and decryption and complete process takes place at the client side. This methodology performs steps such as: a. Authentication, b. Key generation operation, c. Encryption, d. Decryption. [2]. In this proposed system three step procedure is used. Firstly, Diffie Hellman is used for exchanging keys. Thereafter authentication is performed using digital signature scheme. Finally data is encrypted using AES and then uploaded to the required cloud system. For decryption reverse procedure is implemented.

[3]. Combination of RSA algorithm and MD5 to assure various security measures such as confidentiality, data integrity, nonrepudiation etc. It uses RSA key generation algorithm for generation of encrypted key for encryption and decryption process. MD5 digest is used for accepting an input of length up to 128 bit and processing it and generating an output of padded length for encryption and decryption process.

[4]. Implementation of Trusted Storage System using Encrypted File System (EFS) and NTFS file system drive with help of cache manager for securing data files. EFS encrypt stored files by automatically using cryptographic systems. The process takes place as follows, firstly application writes files to NTFS which in turn places in cache and return backs to NTFS. After this NTFS asks EFS to encrypt files and heads them towards the disk. [5]. Cloud Storage Security Service is provided by using separate servers viz. User Input, Data Storage and User Output. Three different servers are used to ensure that failure of any of the servers doesn't harm the data. User Input server is used for storing user files and input data by providing user authentication and making sure the data is not accessed by any of the unauthorized means. Data storage server is the place where the encryption using AES is performed to secure user input and then the encrypted files are transferred to User Output server. User Output Server is the place from where user gets the output file or the decrypted file and uses it for further use.
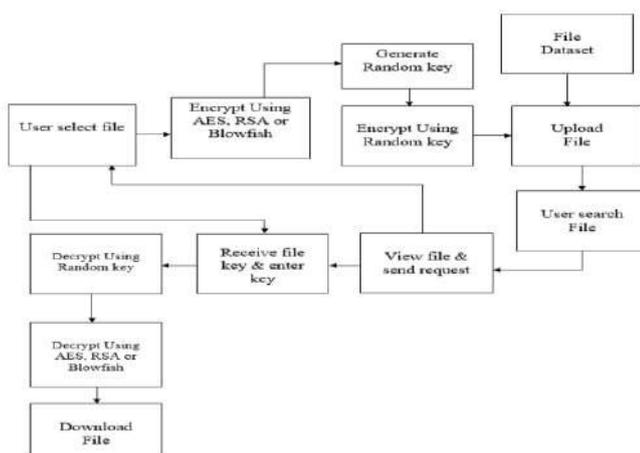
6. System Architecture

Fig. 1 System Architecture

1) The user signs in if already registered, or signs up to register them by providing their details such as name, email id, phone number, password for account etc.
2) The user then selects the file that is to be uploaded by browsing from local storage.
3) The user then selects the encryption algorithm that they want to use. The proposed system provides the choice

between using a combination of AES and RSA or AES and Blowfish.
4) The selected file gets uploaded after getting encrypted using the selected encryption algorithm combination.
5) The user also has the option of viewing the files that they have uploaded or have access to and downloading them.
6) On selecting a file to download it, the user is sent the decryption key on their email id that was entered on registration or sign-up.
7) Using this key, the user can download the decrypted or original file.
8) The system also provides a comparison with respect to security between the two hybrid encryption algorithm combinations AES and Blowfish combination.

7. Conclusion

The users equipped with mobile phones or PDA's interact with the sensors through Wi-Fi.GPS is inadequate for indoor location positioning. Wi-Fi is a technique used for location tracking with wireless access points (AP's).

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Citation of this Article:

Prof. Jyoti Tale, Pawar Ishwari B, Lohar Rohini R, Naik Prathamesh B, "Secure File Storage on Cloud using Hybrid Cryptography" in proceeding of International Conference of Recent Trends in Engineering & Technology ICRTET - 2023, Organized by SCOE, Sudumbare, Pune, India, Published in IRJIET, Volume 7, Special issue of ICRTET-2023, pp 80-83, June 2023.

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