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Key Aggregate Searchable Encryption with Secure and Efficient Group Data Sharing In Cloud



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ABSTRACT

The proficiency of selectively allocating encrypted data with different users via public cloud storage may greatly affluence security disquiets over unintentional data leaks in the cloud. A crucial defy to scheming such encryption schemes lies in the efficient management of encryption keys. The preferred pliability of partaking any group of selected documents with any group of Users demands altered encryption keys to be used for different documents.

However, this also suggests the necessity of securely distributing to users a large number of keys for both encryption and search, and those users will have to securely store the received keys, and submit an equally large number of keyword trapdoors to the cloud in order to perform search over the shared data. The practical problem, which is largely abandoned in the literature, by suggesting the novel concept of key aggregate searchable encryption (KASE) and instantiating the concept through a concrete KASE scheme, in which a data owner only needs to distribute a single key to a user for sharing a large number of documents, and the user only needs to submit a single trapdoor to the cloud for querying the shared documents. The security analysis and performance evaluation both confirm that proposed schemes are provably secure and practically efficient.

INTRODUCTION

Cryptography is the way of storing and sharing the data in the form of that only those authenticated for it can access. It is the knowledge of securing the message by encoding it into an unreadable format. The basic goal of cryptography is the ability to send the information to the receiver in a way that prevents attackers from accessing it. This information is stored on cloud through the internet. The cloud storage is a cloud computing model in which the information is stored and remote servers are accessed from the internet. The cloud storage provider is maintaining, operating and managing the cloud storage on a server. Cryptographic mechanism is used to hide the information from unauthorized users. The most encryption algorithms can be broken and the information is stolen by the attacker. So a more realistic goal of cryptography is to make gaining the information too severe to be value it to the attacker.

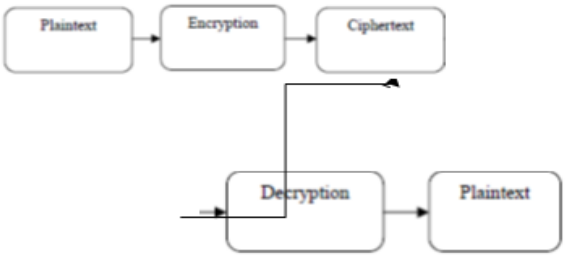

Figure 1: The encryption process converts plaintext into ciphertext and the decryption process converts ciphertexts into plaintext.

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Encryption is a technique of converting original message called clear text or plaintext, into a unreadable format that can't understood by a attacker, called ciphertext. Once it can't be converted into plaintext, the user can't access it until it is decrypted. This enables the broadcast of top secret information over insecure channels without illegal disclosures. When information is stored on a computer, logical and physical access controls are confined it. When this same susceptible information is sent over a internet, it can't take longer these controls for allowed and the information is in much more susceptible state as showed in figure 1.

Encryption and decryption processes are provided by a computer system is referred to as cryptosystem and hardware components and program codes are used to create this system. The cryptosystem uses an encryption algorithm for creating a ciphertext. Most algorithms are difficult mathematical formulas that areapplied to the plaintext. Most encryption techniques use a secret value called a key, which is used to encrypt the plaintext and decrypt the ciphertext.

Figure 2: The algorithm is associated with the key and the result is applied to the message which produces the ciphertext.

In many situations, it is more important that sharing the information must be authenticated rather than encrypted. That is, both sender and receiver should be believed of each other's identity. Goal of this technique is to provide security and the access control. There are different techniques of authentication. Attribute Based Encryption was proposed by A.Sahai and B.Waters. In this scheme in which each user is identified by a set of attributes and some operations of this attributes is used to find out decryption ability for each ciphertext. Identity Based Encryption allows for a sender can encrypt a message to an identity without access to a public key certificate. This technique was proposed by Sahai and Waters. Next is the Key Aggregate Cryptosystem introduced by "Cheng-Kang Chu and Sherman S.M. Chow". This cryptosystem in which one can aggregate any set of private keys and make them as compact as a single key, but it encompass the power of all the keys being aggregated.

EXISTING SYSTEM:

- There is a rich literature on searchable encryption, including SSE schemes and PEKS schemes. In contrast to those existing work, in the context of cloud storage, keyword search under the multi-tenancy setting is a more common scenario. In such a scenario, the data owner would like to share a document with a group of authorized users, and each user who has the access right can provide a trapdoor to perform the keyword search over the shared document, namely, the "multi-user searchable encryption" (MUSE) scenario.
- Some recent work focus to such a MUSE scenario, although they all adopt single-key combined with access control to achieve the goal.
- In MUSE schemes are constructed by sharing the document's searchable encryption key with all users who can access it, and broadcast encryption is used to achieve coarse-grained access control.
- In attribute based encryption (ABE) is applied to achieve fine-grained access control aware keyword search. As a result, in MUSE, the main problem is how to control which users can access which documents, whereas how to reduce the number of shared keys and trapdoors is not considered.

DISADVANTAGES OF EXISTING SYSTEM:

- Unexpected privilege escalation will expose all
- It is not efficient.
- Shared data will not be secure.

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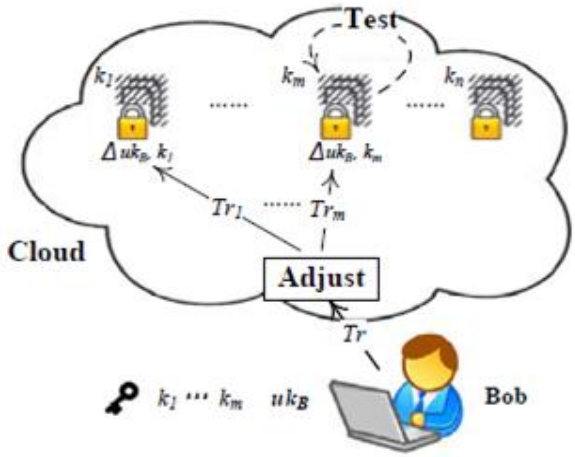
PROPOSED SYSTEM:

- In this paper, we address this challenge by proposing the novel concept of key-aggregate searchable encryption (KASE), and instantiating the concept through a concrete KASE scheme.
- The proposed KASE scheme applies to any cloud storage that supports the searchable group data sharing functionality, which means any user may selectively share a group of selected files with a group of selected users, while allowing the latter to perform keyword search over the former.
- To support searchable group data sharing the main requirements for efficient key management are twofold. First, a data owner only needs to distribute a single aggregate key (instead of a group of keys) to a user for sharing any number of files. Second, the user only needs to submit a single aggregate trapdoor (instead of a group of trapdoors) to the cloud for performing keyword search over any number of shared files.
- We first define a general framework of key aggregate searchable encryption (KASE) composed of seven polynomial algorithms for security parameter setup, key generation, encryption, key extraction, trapdoor generation, trapdoor adjustment, and trapdoor testing. We then describe both functional and security requirements for designing a valid KASE scheme.
- We then instantiate the KASE framework by designing a concrete KASE scheme. After providing detailed constructions for the seven algorithms, we analyze the efficiency of the scheme, and establish its security through detailed analysis.
- We discuss various practical issues in building an actual group data sharing system based on the proposed KASE scheme, and evaluate its performance. The evaluation confirms our system can meet the performance requirements of practical applications.

ADVANTAGES OF PROPOSED SYSTEM:

- It is more secure.
- Decryption key should be sent via a secure channel and kept secret.
- It is an efficient public-key encryption scheme which supports flexible delegation.
- To the best of our knowledge, the KASE scheme proposed in this paper is the first known scheme that can satisfy requirements.

SYSTEM ARCHITECTURE:



A. AUTHENTICATION TECHNIQUES

Authentication is any process that allows one user to establish the identity of other user or entity. The old techniques of authentication are based on the originalities of the physical world; basic individualauthentication is done by identifying distinctive characteristics of other human being. In some cases, such techniques are lacking particularly when authentication must be proficient by a person who does not personally know the person to be authenticated. Some authentication methods determined to be very effective and create the base for this area of work.

1) ATTRIBUTE BASED ENCRYPTION

The ABE [2] is defined as let {A1, A2…An} be a set of parties. A collection U $\subseteq 2^{\{A1, A2....An\}}$ is monotone if

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∀Q, R: if Q ∈ U and Q ⊆ R then R ∈ U. An access structure (respectively, monotone access structure) is a collection (respectively, monotone collection) U of non-empty subsets of, {A1,A2,...An} i.e. U ⊆ $2^{\{A1,A2,....An\}}$.

The sets in U are called the authorized sets, and the sets not in A are called the unauthorized sets. Attribute Based Encryption scheme consists of four algorithms.

Setup: This is a randomized algorithm that takes no input other than the implicit security parameter. It outputsthe public parameters PK and a master key MK.

Encryption: This is a randomized algorithm that takes as input a message*m*, a set of attributes, and the publicparameters PK. It outputs the ciphertext *E*.

Key Generation: This is a randomized algorithm that takes as input- an access structure A, the master key MKand the public parameters PK. It outputs a decryption key

Decryption: It takes as input the user's private key SK for access structure T and the ciphertext E, which was encrypted under the attribute set. This algorithm outputs the message *m* if and only if the attribute set satisfies the user's access structure A.

The KP-ABE system would exactly allow the flexibility we predict in issuing private keys for the unique needs of each user.

2) IDENTITY BASED ENCRYPTION (IBE)

Shamir [9] first proposed the concept of Identity-Based Encryption. However, it wasn't until much later that Boneh and Franklin [3] presented the first Identity-Based Encryption scheme that was both practical and secure.

Their solution made novel use of groups for which there was an efficiently computable bilinear map.To create an IBE scheme in which a ciphertext created using identity p can be decrypted only by a secret key q where |p ∩q| ≥

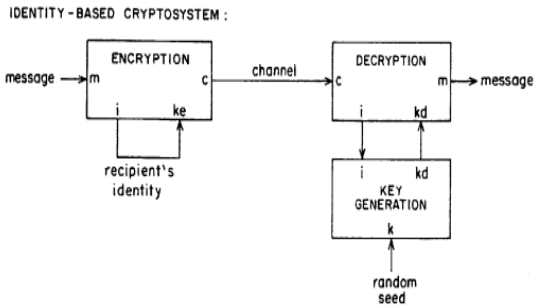

Figure 3: Identity based Cryptosystem (Identity-based cryptosystems and signature schemes [9])

Let G1 be bilinear group of prime order p, and let g be a generator of G1. Additionally, let e : G1 × G1→ G2 denote the bilinear map. A security parameter, k, will determine the size of the groups.

In this approach ciphertexts must be at least as long as the maximum number of attributes that can be required in an encryption.Adi Shamir[9] introduce a novel type of cryptographic scheme, which enables any pair of users to communicate securely and to verify each other's signature devoid of exchanging private or public keys, without keeping key directories, and without using the services of a third parties.

Chow and Waters [5] develop a new technique which allows us to circumvent this problem, and eventually build the desired IB-HPS's with almost the same complexity as the original IBEs. The idea is to add another degree of randomness to our identity-based secret keys, called the "tag" t, coupled with some master secret key terms.

A talented direction is to improve the leakage allowed from each secret key as the fraction of its size. It seems that our results can be generalized by using multiple tags in the secret key, but the security analysis is more complicated.

3) KEY AGGREGATE CRYPTOSYSTEM

In modern cryptography, a fundamental problem often studied is that leveraging the secrecy of a small piece of knowledge into the ability to perform the cryptographic functions (e.g., encryption,

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authentication) multiple times making a decryption key more powerful in the sense that it allows decryption of multiple cipher texts, without increasing its size. This problem is solved by introducing a special type of public-key encryption which is called as key-aggregate cryptosystem (KAC)

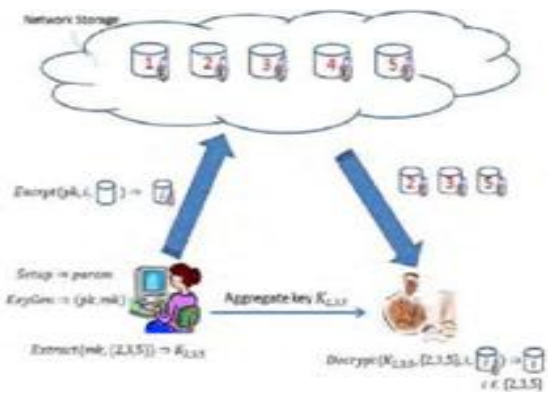

Figure 4: Using KAC for data sharing in cloud storage (Key-Aggregate Cryptosystem for Scalable Data Sharing in Cloud Storage [1])

CONCLUSION

In this paper we have reviewed three authentication techniques: Attribute based encryption (ABE), Identity Based Encryption (IBE) and Key Aggregate Cryptosystem (KAC). The major concern in ABE is collusion-resistance but not compression of secret keys. Definitely, the ciphertext-size is not constant. In IBE, random set of identities are not match with our design of key aggregation. Key Aggregate Cryptosystem protects user's data privacy by compressing the secret key in public key cryptosystem which supports delegation of secret key for different cipher text classes. For future extension it is necessary to reserve enough cipher texts classes because in cloud cipher texts grows rapidly and the limitation is that predefined bound of the number of maximum cipher text classes.

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