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Secure Data Sharing In Cloud Computing By Implementing Amednded Attribute Based Data Sharing Scheme

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Abstract: ***Cloud computing, is a booming computing paradigm, allowing users to remotely hoard their data in a server and provide services on-demand. To ensure the data security in the cloud, Data access control is an efficient approach. the data access control turn out to be a challenging issue in cloud storage systems due to data outsourcing and despaired cloud service providers. Cipher text-Policy Attribute based Encryption (CP-ABE) is regarded as one of the most suitable technologies in cloud storage for data access control, since it gives data owners more undeviating control on access policies. However, it is complicated to directly employ existing CP-ABE schemes to data access control for cloud storage systems due to the attribute revocation issue. A data owner (DO) is generally willing to store huge amounts of data in cloud storage system for saving the cost on local data management. Without any of the data security mechanism, The cloud service provider (CSP), however, can completely gain access to all data of the user. Data owner is permitted to fully regulate the access policy correlated with the data which has to be disclosed. However, CP-ABE is limited to a potential security risk that is known as key escrow problem whereby the secret keys was issued by a trusted key authority to the users. In the proposed system, attribute-based data sharing scheme is revisited in order to solve the issue of "key escrow" and also to improve the persuasiveness of attribute, so that the resultant scheme is more gracious to the application that are implemented through cloud computing. An improved two-party key issuing protocol has been implemented that which assure that neither key authority nor cloud service provider can be conceded the whole secret key of a individual user.***

Keywords: *Attribute Encryption, Key-policy, Cipher text, Schemes.*

1.INTRODUCTION

As we progress through the internet era, no wonder distributed technology of computing playing a key role. Data sharing also becomes an essential role to meet the needs of distributed technology. Any small piece of data is also accessible to many users from anywhere using cloud systems. Those end server systems must have complete confidence of data it stores. The server controls the user access hierarchy and restriction to end users and peers. If the server is hacked, data integrity will be lost and security is compromised. To enhance the security, encryption techniques are embedded to the server for data confidentiality and security. Private key pairs are used by the users to encrypt the data. But typical private keys are very hard to handle for complex encryption control policies. The access policies are described as attributes (Eg. City, Position) but it is best to have as actual identities of user. Attribute based Encryption was first introduced by Sahai and Waters. It was introduced to create encryption concepts based on expressiveness. Attribute plays a key role in ABE system. This ABE is mainly used to create policies for user access. It is aimed to fulfil one-to-many encryption with requirements specified.

ABE is a public key pair encryption. The ciphertext and the secret key that the user holds depends on the attribute value (eg: the profession he attained, place he resides). This allows the user to secure the data by encrypting it or view the secured data by decryption.Encryption takes place using the user attributed. The decryption can be done only if the key matches the attributes of user specified. Access policy is classified into key-policy and ciphertext policy based on the user policies. The first Key-Policy Attribute Based Encryption (KP-ABE) was proposed by Goyal [2] which allows a specific access structure. The first Cipher-Policy Attribute Based Encryption was proposed by Bethencourt and many such schemes were proposed later. There are numerous schemes proposed recently using multiple authorities generating private user keys. The main security advantage of Attribute Based Encryption is collusion resistance.

The access to data will be provided to authority only if a minimum of single key grants access. Moreover, Muller offered an distributed attribute-based encryption scheme in 2008; Yu e. proposed a finegrained data access control encryption scheme ; Tang proposed a Verifiable attribute based encryption scheme. Enhanced ABE scheme proposed by Ostrovsky et al. an which supports non-monotone access structures[8]. In 2008 Muller et al. proposed an distributed attribute-based encryption scheme [9]. Wang et al. pro- posed a hierarchical attribute-based encryption scheme(HABE) [10] in 2010. which integrates properties in both a HIBE (hierarchal identity based encryption) model and a CP-ABE model. There after introduce MA-ABE (multi-authorities ABE) schemes that use multiple parties to distribute attributes for users. ABE schemes can be further considered as either monotonic or non- monotonic built on their type of access structure

2. LITERATURE REVIEW

The literature survey consists of the study of Attribute Based Encryption, KP-ABE, and CP-ABE.

*1. **Attribute Based Encryption (ABE)***

Sahai and waters first came up with the idea of Attribute Based Encryption. The main idea of attribute based encryption is public key cryptosystem in which the attributes consists of the cipher text and the secret key that is owned by the user. There are some user attributes that are connected with ciphertext, the ciphertext can be decrypted only if the attributes owned by the user key equals the cipher text attributes. Attribute Based Encryption can be classified into two groups Ciphertext-Policy ABE (CP-ABE) and Key-Policy ABE (KP-ABE) based on the access policy enclosed into the secret key owned by the user or ciphertext.

1.1 Data Sharing Architecture

Data Owner , cloud server, key distribution centre and end user are the four major elements of Data Sharing Architecture

Data Owner

Data owner uses cloud server to store their data, the data will always be encrypted for security reasons before storing. The data owner can work on encrypted data file and also they
can set the access privilege to that.

Cloud Server

In this , a cloud is managed by a cloud service provider which is used to store data. Data files will be encrypted and stored in cloud by the data owners to share the data with data consumers. The data consumers first need to choose the data files which they need and export the encrypted data file from the cloud and then the shared data file should be decrypted. For security reasons all the end users should be authorized.

Key Distribution centre

KDC plays many roles such as capturing the hackers, save verification parameters, offer public enquiry services for attributes such as creating secret key for a data file and share to the correct end user.

Data Consumer/End User

Each data file have different access privilege, the privileges are decided by the data owner and they also controls the data users. The end user can access the data file only if they have the access to the file and encrypted key. Normal users try to access the data files within their access privileges and hackers may try to get confidential files for which they don't have access. KDC generates and shares the secret key with the authorized users if it gets request from the user to do so.

Attacker (Unauthorized User)

Cloud server is used to store the data file, in this cloud server the attacker may add the malicious data to any block , so the unauthorized users are usually considered as attackers.

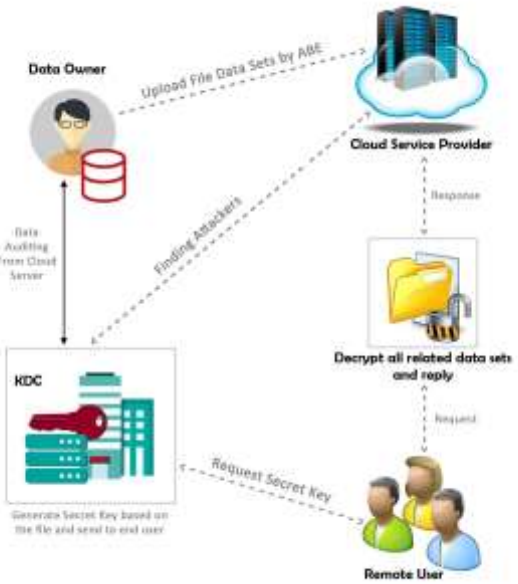

Figure 1: Architecture of Data Sharing

1.2 ABE Algorithm Model

In basic ABE, both the secret key of user and cipher text used will be labelled with attributes. A key can decrypt the cipher text to get access to the data only if it has a certain combination of attributes present on both cipher text and the secret key of user. So the decryption takes places in a KP-ABE or CP-ABE schemes only if the attribute set used in the secret key and cipher text abides the access structure.ABE basically has four algorithms. They are Setup, Encryption, Decryption

and Key generation which consists of sender to send, authority to validate the data and receivers with participants.

A. Setup: (K, U)->(PP,MSK): This algorithm uses the parameter K as input and returns Public Key and master Secret Key as output. The senders use PP to encrypt the data. The authority alone knows the MSK which is used to create secret keys.

B. Key Generation: (K,PP,MSK,S)->SK: Key generation algorithm uses the inputs as public parameter PP, master secret key MSK, attribute set S and it generates a key to decrypt SK, this key helps the user to decrypt the data using an access tree structure T only if T matches

C. Encryption: (K, PP, M, T)->CT : In the Encryption algorithm, the sender would encrypt a message M, using a public parameter PP, an access structure T and an attribute set S. The output of this algorithm is a ciphertext CT

D. Decryption: (K, PP, SK,CT)->M: In this algorithm, public parameter PP and ciphertext CT are taken as input with a secret key SK for an attribute set SK. The output of this algorithm is a message only if the associated ciphertext matches the access structure.

2. Key-Policy Attribute Based Encryption (KP-ABE)

KP-ABE is a new refined type of ABE scheme. Goyal el al. in 2006 introduced the First key-policy scheme. Through KP-ABE encrypted data can be shared with great attention to detail and this also allows one to many relationships. In this attribute each cipher text has an attribute set and user's secret key which is generated by authority. An access structure also policy is used to associate the secret key to decrypt the data. The access structure provides details of the list of cipher texts the user can decrypt. In other words, the decryption can be done only if the cipher text attributes matches the access structure associated with the private key. This KP-ABE scheme will be best suited for professional and structural organisations and institutions which creates rules to create access and restrictions for a particular document. This scheme prevents unauthorised user to decrypt the data even if data resides in an insecure server.

3. ***Ciphertext-Policy Attribute Based Encryption (CP-ABE)***

CP-ABE scheme is the other type of ABE scheme. We use remote servers to store our files for various reasons. The files may be intended to be scalable to other users using resources from elsewhere. Reliability can be achieved in case of network failures where the data can be re-created again as it is in a remote server. This scheme has its primary focus on security which has a tension with other properties. As our files get replicated there are more chances for hackers and attackers to get control of the system. This tension makes the CP- ABE scheme very useful. When there is a requirement for which user can access what files should be done securely using CP-ABE.

CP-ABE can also be categorised as an extension of identity-based-encryption. In identity based encryption, it has a master private key which used to generate many more private keys and one public key. But CP-ABE is not just an identity based encryption as it is extended with more flexibility. This allows complex rules to specify explicitly to pair a private key to a cipher text for decryption. All private keys are associated with attribute sets and the encryption has an access structure or policy which will help to decrypt the data by identifying which key will be required to decrypt.

CP-ABE has a set of attributes and a private key. The attributes are associated to users and the keys are generated based on attribute set. During encryption of a message M, an access structure is defined by an encryptor. This access structure is defined in attribute sets for Message. The rules are specified for encrypting the data, which is only those specified attributes which abides by the access structure, can be granted access to decrypt the message. Unauthorised users even if they collude they cannot decrypt the cipher text because the access policy allows the encryption to choose the key which has the associated attribute set. This concept is built upon basic access control schemes.

4. Attribute-Based Encryption Scheme With Non- Monotonic Access Structures

Earlier ABE schemes were restricted to expressing only monotonic access structures and there is no acceptable method to represent negative limitations in a key's access formula. Ostrovsky et al. proposed an ABE with non-monotonic access structure in 2007. Non- monotonic access structure can be use the adverse word to describe every attributes in the message, but the monotonic access structure cannot.

5. Hierarchical Attribute-Based Encryption

The scheme Hierarchical attribute-based encryption (HABE) is derived over Wang et al The HABE model (Fig 2) holds of a root master (RM) that corresponds to the third trusted party (TTP) and many domain masters (DMs) in which the top-level DMs relate to many enterprise users, and several users that correspond to totally personnel in an enterprise. The HABE scheme used the property of the hierarchical generation of keys in Hierarchical attribute-based encryption (HIBE) scheme to generate keys.

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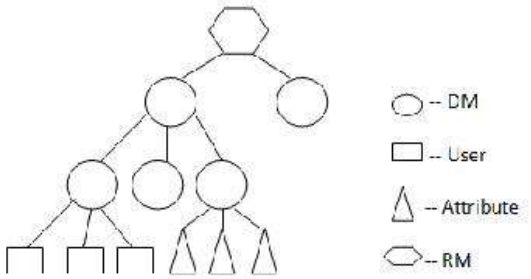

Figure 2: HABE model

3.ABE SECURITY ANALYSIS

ABE scheme has great security features and functionalities which are specified below.

1. Data Confidentiality:Access to the raw data is prevented from unauthorised users. The information is encrypted from unauthorized users, as they do not have required attribute set to match the criteria of access structure policy. Hence, the unauthorised access from KGC and data-storing centers to the plain text data is prevented from the attackers.

2. Collusion Resistance:Collusion resistance is an important functionality in ABE scheme. If the users become dishonest and try to decrypt the data, it is not possible because the users can only have a part of attribute set and it cannot match the attribute set criteria. Even if multiple users combine their attribute set, it will not match the criteria of the access structure policy.

3. User/attribute revocation*:*When an user leaves the system the policy revokes the access of the user to the system.

4. Scalability:The scheme doesn't not have adverse effects when more users enter the policy. It has the functionality to maintain the same performance throughout system for all users. Even if the users authorised are increased dynamically the system will provide good performance.

4. COMPARITIVE ANALYSIS

This comparison shows (Table .1) that CP-ABE scheme is much more efficient than KP-ABE scheme. This scheme is more adapted for sharing the data in a cloud on remote servers. The data owners have the complete control of the data access policy. This scheme resolves the disadvantages of using KP-ABE schemes where the encrypted data cannot decide who can decrypt the data. Access control is also supported by this scheme in real-time. It also contains the private key of user and set of attributes associated. By using this attributes only the user can be able to satisfy the access control to decrypt the data. This CP-ABE scheme also has some disadvantages. One of the drawbacks of this scheme is not completely fulfilling the requirements of access control with flexibility and efficiency. The access control has to be improved. Also only user attributes which are organised logically into a single set are supported by the decryption keys. So users cannot use attributes from different set and can only use possible combinations from a single set.

Technique /Parameter	ABE	KP-ABE	CP-ABE	HABE	MA-ABE
Efficiency	Average	Average, High for Broadcast type system	Average, Not efficient for modern enterprise	Flexible	Scalable
Computational Overhead	High	Most of computational overheads	Average computational overhead	Some of overhead	Average
Fine grained Access Control	Low	Low, High if there is reencryption	Average Realization of complex access control	Good Access Control	Better Access Control
Collusion resistant	Average	Good	Good	Good	High collusion resistant

Table 1. Comparative Analysis

Comparatively MA-ABE has a better access control and it is more scalable and has a higher collusion resistance. ABE has a good access control, however has computational overhead. In ABE, there is a low access control and it has a average efficiency and resistance towards collusion.

5. PROPOSED SYSTE

An attribute-based data sharing scheme is being proposed for cloud computing applications, which is represented as as cipher text-policy weighted ABE scheme with removing escrow (CP-WABE-RE). It resolves two types of issues: key escrow and arbitrary- sate attribute expression.

• An improved key issuing protocol is used to resolve the key escrow problem of CP-ABE in cloud computing. The protocol can prevent KA and CSP from knowing each other's master secret key so that none of them can create the whole secret keys of users individually. Data confidentiality and privacy can be ensured.

• Weighted attribute is used to improve the expression of attribute. The weighted attribute can reduce the complexity of access policy. Thus the storage cost of cipher text and computation complexity in encryption can be reduced. It can express larger attribute space than everunder the same condition.

6. CONCLUSION

Proposed system, we reformed an attribute-based data sharing scheme in cloud computing. The key escrow problem was resolved by enhanced key issuing protocol . It enhances data confidentiality and privacy in cloud system against the managers of Key Distribution Center (KDC) and Cloud Server Providers as well as malicious system outsiders, where Key Distribution Center (KDC) and Cloud Server Providers are semi-trusted. In addition, the weighted attribute was proposed to improve the expression of attribute, which can not only describe arbitrary state attributes, but also reduce the complexity of access policy, so that the storage cost of ciphertext and time cost in encryption can be saved.

Conclusively, in the proposed system it has been proved that performance and security analyses, in which the results express highest efficiency and security of our scheme.

7. FUTURE ENHANCEMENT

In the intended system The Data owner shared the data in cloud server using Attribute Based Encryption and if the Remote user wants to view the data in the cloud server then the user has to get secret key provided from Key Distribution Center (KDC) and only the authorized user can able to view the files. The Key authority has all the privileges to access or modify the secret key sent to the user. This level of privilege provided to the key authority leads to illegal usage of the secret key and makes a breach in the secure sharing of data. In order to solve the above mentioned issue, as a future enhancement a concept of session can be included with the secret key to avoid the security breach. The key authority can be provided with the secret key with the session time, with which the secret key provided to the user who request to access the files but with the session allots to the secret key, within the session provided the secret key will be valid and active else the secret key will be invalid.

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