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Augmenting Privacy for Cloud users through Advanced Access Control Scheme for Multi-Authority Cloud Storage

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Abstract: Day to day Cloud Computing is expanding massively because of its favorable position of giving adaptable storage prerequisite. The clients are begun to share their touchy data through the cloud because of its tendency of giving accommodation to clients. The security of the data must be guaranteed to the clients while putting away their subtle elements into the cloud server. In the current work an expressive, proficient and revocable data access control plan for multi-power distributed storage frameworks are proposed to bolster the power access control get from the numerous property powers. The clients the individuals who are having coordinating properties as in the access approach defined in the figure content can recover the whole data content. It intends to permit the clients with qualified credits to unscramble the whole data put away in the cloud server. On the other hand, it can't constrain the clients from accessing the data's which are not accessible to them. That is it can't restrict the data access control to the approved clients. In this work a novel calculation to be specific Security improved Data Access Control Plan is proposed to defeat the issue exist in the current work. In the current work data, access control is constrained to the client from the unapproved clients though in the proposed calculation plan to restrict the data access control to the approved client.

Key Terms: access control; multi-authority; security; cloud storage

I.INTRODUCTION

One important service provided by cloud computing to the data owners to outsource their data in cloud is cloud storage. The method of data outsourcing and data access counters a major challenge in data access control. The reason is that the data owners cannot fully trust the cloud servers. CiphertextPolicy Attribute-Based Encryption (CP-ABE) is considered as acceptable technology in cloud storage systems for data access control. In this scheme, there is an authority which is responsible for attribute management and key distribution. For multi-authority system, cipher text policy based encryption is deployed. It handles the attributes from different authorities. The encrypted plain text is integrated with attributes. By using the symmetric key encryption algorithm the data will be encrypted under the access control scheme came from the attribute authority. The CP-ABE system is classified into two types: single-authority CP-ABE, where single authority manages all the attributes, and multi-authority CP-ABE, where different authorities manage attributes from different domains. Multiauthority CP-ABE is most suitable for data access control in cloud storage systems, as multiple authorities issues attributes that user holds and the data owners can share their data's. In this paper we propose Privacy enhanced Data Access Control Scheme. Before storing the data's in the cloud, the owner will encrypt the message with the different ideas which are created randomly. After encryption, the aggregated key for the receiver in order to decrypt the message will be generated with the help of owner private key. The receiver can retrieve the content that he needed by decrypting the cipher text with the help of aggregated key and corresponding access permission id. In this work the data anonymity level is increased by wrapping the data values before data

transmission. That is user request is achieved by wrapping around the user access permission details with the data before transmitting/ storing it in the server. Hence only the user who satisfies the corresponding access permission details like verification information only will gain access to it. Based on the access permission given to the users, the new encryption key will be generated for individual users. By using the encryption that is generated for the unique user, each user can download the data's which is only accessible to them. In our scheme, the key update is done by each attribute authority and not by the servers. The semi trusted natures of authorized user are eliminated where the data's are hidden from the authorized users also and it achieves more privacy and security over data's

II. BACKGROUND

Various computing needs are to be provided for the users and companies, who use cloud services. Reliability and availability should be maintained with the Cloud Service Provider in the form of Data Centers, they are maintaining in any part of the world. Apart from these, customers who are worried about their data which contains sensitive information such as medical records or financial information and business related data has to be stored securely

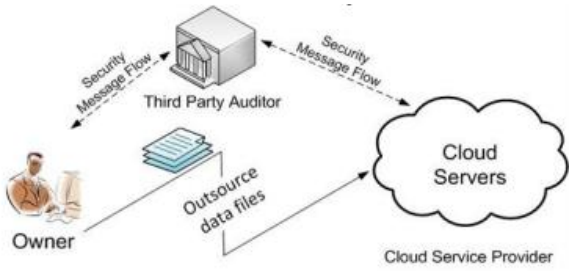

Fig 1. Cloud Storage Scenario

. 1. Security Risks in Single and Multi-authority cloud storage While users outsource their confidential information to cloud, the cloud service provider verifies the user data with the Third Party Auditor without knowing the data; it verifies the integrity and correctness of data. In single cloud, due to any byzantine failure or service unavailability, network problems with disaster or some other leads the user data in risks. Even they had been protecting using Cryptosystems; Cloud Service Provider cannot assure the risk involved in Single cloud or Multi-authority cloud storage.

III. SYSTEM MODEL AND SECURITY MODEL

SYSTEM MODEL The data access control scheme which we consider in multi-authority cloud storage is described in Fig. 1. Five types of entities are there in the system: certificate authority (CA), attribute authority (AA), data owner, data consumer, the cloud server. The trusted certificate authority in the system is the CA. The system is set up and the registration of all user and AAs are accepted. The CA assigns the global unique id and also generates a global public key for each legal user. AA is responsible for revoking user's attributes according to their role or identity. Every attribute is associated with single AA, but number of attributes is managed by AA. The attributes" structure and semantics are controlled by every AA. The public attribute key for each attribute it manages and a secret key or each user is generated by each AA. This architecture states that the owner outsources the data with the semi-trusted cloud servers with encrypted cryptosystems. When users want to access the data from cloud servers, users has to be maintained by the Certificate Authority who issues the authentication certificate to user to access data. After obtaining the certificate user and owners share the data with the attributes verification for data access. In this system each user has a global identity. The user can have set of attributes which come from multiple attribute authorities. The corresponding attribute authorities entitle its user associated with a secret key. The data is divided into several components by the owner and each data component is encrypted with different content keys using symmetric encryption.

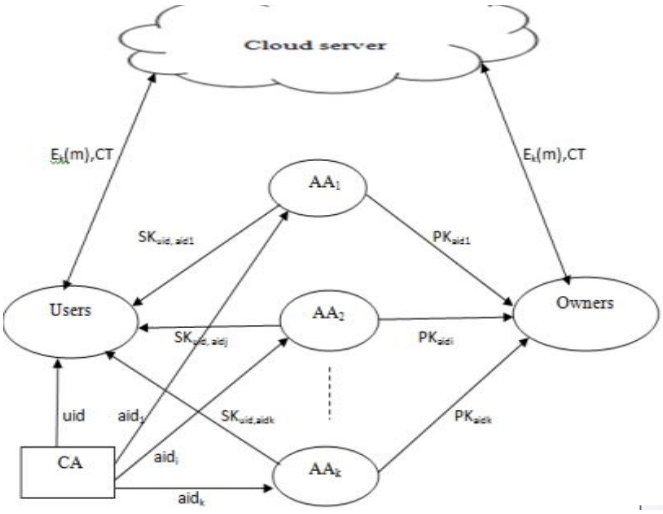

Fig 2. System Architecture

The access policies over the attributes are defined are defined by the owner and encrypts the content keys under the policies. The owner then sends the encrypted data together with the ciphertexts to the cloud server. The user is able to decrypt the ciphertext only when the user's attributes satisfy the access policy defined in the ciphertext. The different number of content keys is decrypted by users with different attributes and from same data different information's are obtained.

STRUCTURE The structure of the data access control scheme for multiauthority cloud storage system consists of following phases. Phase 1: System initialization. CASetup (1λ•): (GMK, GPP, (GPK" uid, GPK" uid), (GSKuid;GSK" uid), Certificate(uid)). The CA setup algorithm is run by the CA. It takes no input other than the implicit security parameter λ. It generates the global master key GMK of the system and the global public parameters GPP. For each user uid, it generates the user" s global public keys (GPKuid, GPK" uid), the user" s global secret keys (GSKuid , GSK" uid) and a certificate Certificate (uid) of the user.

AASetup (Uaid):(SKaid, PKaid, {VKxaid, PKxaid }xaid ϵ Uaid). The attribute authority setup algorithm is run by each attribute authority. It takes the attribute universe Uaid managed by the AAaid as input. It outputs a secret and public key pair (SKaid, PKaid) of the AAaid and a set of version keys and public attribute keys {VKxaid, PKxaid }xaid ϵ Uaid for all the attributes managed by the AAaid.

Phase 2: Attribute Authority's key management. Secret Key Distribution: A randomized algorithm takes as input the authority" s secret key SK, a user u's UID, and a set of attributes Aku in the authority AAk's domain (We will assume that the user's claim of these attributes has been verified before this algorithm is run, Au = {Aku , k = 1, . . . , n}). Output a secret key Du for the user u. Access Permission id Distribution: The collected attributes from all attribute authorities (AC) will be sent to the users for the encryption purpose.

Phase 3: Data Encryption. The data owner runs the encryption algorithm to encrypt the content keys. By using symmetric encryption method the data is encrypted with content keys. A randomized algorithm takes as input an attribute set of a message M, the system public parameters PK and outputs the ciphertext C.

Phase 4: Data Decryption. To obtain the content keys, the users first run the decryption algorithm and use them to decrypt data's further. Interpolation will be done: A deterministic algorithm takes as input a ciphertext C, which was encrypted under an attribute set and decryption key. Output a message m for atleast t+1 honest attribute authorities.

SECURITY MODEL

The following assumption is made in multi-authority cloud storage systems: In the system the CA is fully trusted. It will not cooperate secretly with any user and should be prevented from decrypting the ciphertext by itself. The trusted AA can be corrupted by the adversary. The server is curious about the content of data to be encrypted or to the message received. But the server is honest and will execute the task assigned by each attribute authority correctly. The dishonest user may co-operate secretly to obtain the unauthorized access of data.

IV. DATA ACCESS CONTROL SCHEME

The overview of constraints and techniques is given in the system. The construction of access control scheme consists of five phases: System initialization, Key Generation, Data Encryption, Data Decryption and Attribute Revocation.

A. OVERVIEW

The major constraint to design the data access control scheme is to develop the revocable multi-authority CP-ABE protocol. This protocol is not directly deployed because of the two major reasons:

1) Security Constraint: The central authority holds the master key of the system and is allowed to decrypt the ciphertexts.

2) Revocation Constraint: Attribute revocation is not supported by this protocol. Based on single-attribute CP-ABE a fresh revocable multiauthority CP-ABE protocol. In this method, to prevent illegal co-operation, we combine the secret keys produced by various authorities for same user. The functionality of authority is separated as global certificate authority (CA) and multiple attribute authority (AAs). The system is setup up by CA and registration of the user's and AAs are accepted. For each user, a global user identity uid and for each attribute authority, a global authority identity aid is assigned. Because of the globally unique uid, the secret key issued by various AAs for same user is combined together for decryption. To overcome the security constraints, despite

of using the system unique public key to encrypt data, our method needs all attribute authorities to provide their own public key to encrypt data combined with global public parameter. In this scheme the certificate authority is prevented from decrypting the ciphertext. The attribute revocation problem is solved by assigning the version number for each attribute. An attribute revocation happens only when the components associated with the revoked attribute in secret keys and ciphertext needs to be updated. When the user's attribute is revoked from its corresponding AA, it generates a fresh version key for this revoked attributes and update key is generated. With the generated update key all user who are holding the revoked attribute can update its secret key. The revoked attribute can be updated to new version using the update key. The efficiency can be improved by using the proxy re-encryption method for selecting the workload of ciphertext update, so that freshly joined user can able to decrypt the data that was published earlier.

B. SYSTEM INITIALIZATION

The system initialization consists of two steps: CA setup and AA setup.

1. **CA Setup** Taking input as security parameter, the CA sets up the system using the CAsetup Algorithm. The CA registers both user and AA.

User Registration: During system initialization each and every user should register to CA. The global unique user id uid is assigned to user by the CA, if the user is a legal user.

AA Registration: During system initialization the AA should register to CA. The CA assigns a global attribute authority identity aid if the AA is the legal authority.

2. **AA Setup** In this algorithm, the set of user attributes and data owner attributes are stored in data set, which provides the secret key obtained by matching the public key pair AAaid as input.

SkeyGen(GPP,GPKuid,GPkuid,GSKuid,SKaid,Suid,aid…) ={GPK,(PKaid1..n)with uidK} =SKuidnaidn

C.SECRET KEY GENERATION When data owners outsource their data with some attributes and is encrypted by attributes identity (aid) then it authenticates with user identity (uid), which is issued by CA.

D. DATA ENCRYPTION BY OWNERS Before outsourcing the data's to cloud, the data owner first partitions the data into several components according to logical granularities as m={m1,….mn}. For example, data can be partitioned into {name, address, employee, salary, contact number}, next the data components is encrypted with different content keys{k1,…..,kn} using symmetric encryption method, last the access structure mechanism Mi is defined for each content key ki(i=1,…,n). The encryption algorithm takes GPP as input, a collection of public keys fpr all AAs and outputs the ciphertext

E. DATA DECRYPTION BY USERS In existing scenario, user login in to the CSPs and the data's can be downloaded with the normal registration, but in existing system the CA will check the user authentication entity. The user can obtain the content key only when it satisfies the access structure defined in the ciphertext CT.

V. SECURITY ANALYSIS

Our data access control is secure when we achieve both forward security and backward security such as the AAid and GPPuidaid at the time of data encryption and along with ciphertext CT, GPKuid,GSKuid we obtain the K to decrypt the content.

1. FORWARD SECURITY The version of the revoked attribute is updated after attribute revocation problem. The secret keys are associated with attributes with the latest version, when a fresh user joins the system. The early published ciphertext are encrypted under attributes with previous version. The early published ciphertext can be updated to new version by using ciphertext update algorithm, so that the new user's can decrypt the previously published ciphertexts,if their attribute satisfy the access policy defined in the ciphertext. The forward security is guaranteed.

2. BACKWARD SECURITY The AA generates an update key for each non revoked user, during the secret key update phase. The revoked user cannot use update keys of other non-revoked users to update its own secret key, because the update key is associated with the user's global identity uid, even if it may compromise to some non-revoked users. Moreover, suppose the revoked user can corrupt some other AAs, the item in the secret key can prevent users from updating their secret keys with update keys of other users. This guarantees backward security.

VI.PERFORMANCE:

Ciphertext-Policy Attribute-Based Encryption (CP-ABE) [2]-[3] is a promising technique that is designed for access control of

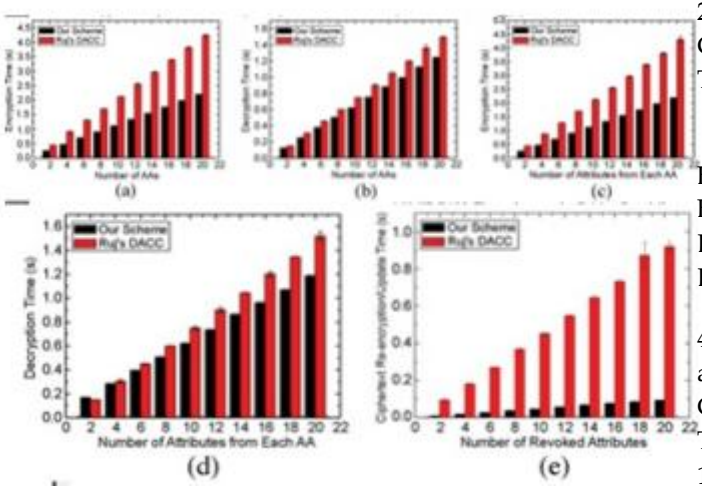

Fig. 3. Comparison of Computation Time. (a) Encryption. (b) Decryption. (c) Encryption. (d) Decryption. (e) Re-encryption. Encrypted data.

There are two types of CP-ABE systems: single authority CP-ABE [2], [3], [4], [5] where all attributes are managed by a single authority, and multiauthority CP-ABE [6],[7], [8] where attributes are from different domains and managed by different authorities. Multi-authority CP-ABE is more appropriate for the access control of cloud storage systems, as users may hold attributes issued by multiple authorities and the data owners may share the data using access policy defined over attributes from different authorities. However, due to the attribute revocation problem, these multi-authority CP-ABE schemes cannot be directly applied to data access control for such multi-authority cloud storage systems. To achieve revocation on attribute level, some encryption-based attribute revocation schemes [9], [11] are proposed by relying on a trusted server.

VII. CONCLUSION

Although the use of cloud computing has rapidly increased, the security in cloud is major issue, and at the same time users don't want to lose their data. In this paper, we introduced a novel approach called Distributed key distribution mechanism. Then the effective data access control scheme is constructed for multi-authority cloud storage systems. This technique can be deployed in any social networks and remote storage systems.

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