IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 5, Issue 9, September 2016

Cloud Service using Differential Query System

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Abstract: Data sharing is an important functionality in cloud storage. In this article, we show how to securely, efficiently, and flexibly share data with others in cloud storage. We describe new public-key cryptosystems which produce constant-size cipher texts such that efficient delegation of decryption rights for any set of cipher texts are possible. The novelty is that one can aggregate any set of secret keys and make them as compact as a single key, but encompassing the power of all the keys being aggregated. In other words, the secret key holder can release a constant-size aggregate key for flexible choices of ciphertext set in cloud storage, but the other encrypted files outside the set remain confidential. This compact aggregate key can be conveniently sent to others or be stored in a smart card with very limited secure storage. We provide formal security analysis of our schemes in the standard model. We also describe other application of our schemes. In particular, our schemes give the first public-key patient-controlled encryption for flexible hierarchy, which was yet to be known.

Keywords: Cloud storage, Data Sharing, key-aggregate encryption, patient-controlled encryption, Clustering.

1. INTRODUCTION

Cloud storage is gaining popularity recently. In enterprise settings, we see the rise in demand for data outsourcing, which assists in the strategic management of corporate data. It is also used as a core technology behind many online services for personal applications. Nowadays, it is easy to apply for free accounts for email, photo album, file sharing and/or remote access, with storage size more than 25GB (or a few dollars for more than 1TB). Together with the current wireless technology, users can access almost all of their files and emails by a mobile phone in any corner of the world. Considering data privacy, a traditional way to ensure it is to rely on the server to enforce the access control after authentication, which means any unexpected privilege escalation will expose all data.

In a shared-tenancy cloud computing environment, things become even worse. Data from different clients can be hosted on separate virtual machines (VMs) but reside on a single physical machine. Data in a target VM could be stolen by instantiating another VM co-resident with the target one. Regarding availability of files, there are a series of cryptographic schemes which go as far as allowing a third-party auditor to check the availability of files on behalf of the data owner without leaking anything about the data, or without compromising the data owner's anonymity. Likewise, cloud users probably will not hold the strong belief that the cloud server is doing a good job in terms of confidentiality. A cryptographic solution, with proven security relied on number-theoretic assumptions is more desirable, whenever the user is not perfectly happy with trusting the security of the VM or the honesty of the technical staff. These users are motivated to encrypt their data with their own keys before uploading them to the server. Data sharing is an important functionality in cloud storage. For example, bloggers can let their friends view a subset of their private pictures; an enterprise may grant her employees access to a portion of sensitive data.

The challenging problem is how to effectively share encrypted data. Of course users can download the encrypted data from the storage, decrypt them, then send them to others for sharing, but it loses the value of cloud storage. Users should be able to delegate the access rights of the sharing data to others so that they can access these data from the server directly. However, finding an efficient and secure way to share partial data in cloud storage is not trivial.

2. IMPLEMENTATION

Implementation is the stage of the project when the theoretical design is turned out into a working system. Thus it can be considered to be the most critical stage in achieving a successful new system and in giving the user, confidence that the new system will work and be effective.

The implementation stage involves careful planning, investigation of the existing system and it's constraints on implementation, designing of methods to achieve changeover and evaluation of changeover methods. In this phase, various modeling techniques are selected and applied, and their parameters are calibrated to optimal values. Typically, there are several techniques for the same data mining problem type. Some techniques have specific requirements on the form of data. Therefore, stepping back to the data preparation phase is often needed.

2.1 EXISTING SYSTEM:

There exist several expressive ABE schemes where the decryption algorithm only requires a constant number of pairing computations. Recently, Green et al. proposed a remedy to this problem by introducing the notion of ABE with outsourced decryption, which largely eliminates the decryption overhead for users. Based on the existing ABE schemes, Green et al. also presented concrete ABE schemes with outsourced decryption. In these existing schemes, a user provides an untrusted server, say a proxy operated by a cloud service provider, with a transformation key TK that allows the latter to translate any ABE cipher text CT satisfied by that user's attributes or access policy into a simple cipher text CT', and it only incurs a small overhead for the user to recover the plaintext from the transformed cipher text CT'. The security property of the ABE scheme with outsourced decryption guarantees that an adversary (including the malicious cloud server) be not able to learn anything about the encrypted message; however, the scheme provides no guarantee on the correctness of the transformation done by the cloud server. In the cloud computing setting, cloud service providers may have strong financial incentives to return incorrect answers, if such answers require less work and are unlikely to be detected by users.

Disadvantages:
1. Untrusted server cannot share the data freely to anyone.
2. No guarantee on the correctness of transformation of data done by the cloud server.

2.2 PROPOSED SYSTEM:

We considered the verifiability of the cloud's transformation and provided a method to check the correctness of the transformation. However, the we did not formally define verifiability. But it is not feasible to construct ABE schemes with verifiable outsourced decryption following the model defined in the existing. Moreover, the method proposed in existing relies on random oracles (RO). Unfortunately, the RO model is heuristic, and a proof of security in the RO model does not directly imply anything about the security of an ABE scheme in the real world. It is well known that there exist cryptographic schemes which are secure in the RO model but are inherently insecure when the RO is instantiated with any real hash function.

In this thesis work, firstly modify the original model of ABE with outsourced decryption in the existing to allow for verifiability of the transformations. After describing the formal definition of verifiability, we propose a new ABE model and based on this new model construct a concrete ABE scheme with verifiable outsourced decryption. Our scheme does not rely on random oracles.

In this paper we only focus on CP-ABE with verifiable outsourced decryption. The same approach applies to KP-ABE with verifiable outsourced decryption. To assess the performance of our ABE scheme with verifiable outsourced decryption, we implement the CP-ABE scheme with verifiable outsourced decryption and conduct experiments on both an ARM-based mobile device and an Intel-core personal computer to model a mobile user and a proxy, respectively.

Advantages of proposed system:
1. The extracted key have can be an aggregate key which is as compact as a secret key for a single class.
2. The delegation of decryption can be efficiently implemented with the aggregate key.

3. SYTEM DESIGN

i) INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

ii) OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
2. Select methods for presenting information.
3. Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

4. IMPLEMENTATION

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DOI 10.17148/IJARCCE.2016.5970

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The implementation stage involves careful planning, investigation of the existing system and it's constraints on implementation, designing of methods to achieve changeover and evaluation of changeover methods.

MODULES

1. Setup Phase.
2. Encrypt Phase.
3. KeyGen Phase.
4. Decrypt Phase.

4.1 SETUP PHASE:

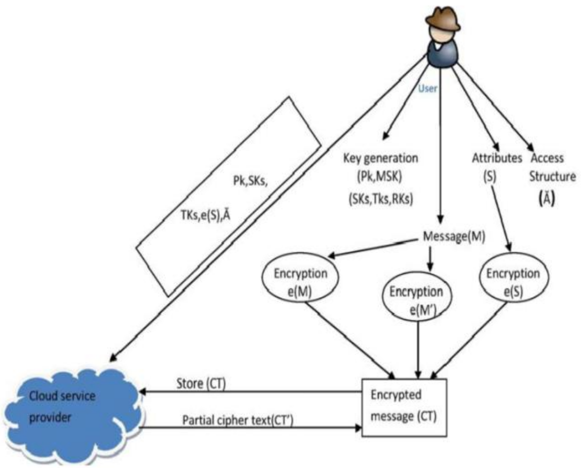
The setup algorithm takes no input other than the implicit security parameter. It outputs the public parameters PK and a master key MK.

4.2 ENCRYPT PHASE:

Encrypt (PK, M, A). The encryption algorithm takes as input the public parameters PK, a message M, and an access structure A over the universe of attributes. The algorithm will encrypt M and produce a cipher text CT such that only a user that possesses a set of attributes that satisfies the access structure will be able to decrypt the message. We will assume that the cipher text implicitly contains A.

4.3 KEY GEN PHASE:

Key Generation (MK,S). The key generation algorithm takes as input the master key MK and a set of attributes S that describe the key. It outputs a private key SK.



4.4 DECRYPT PHASE:

Decrypt (PK, CT, SK). The decryption algorithm takes as input the public parameters PK, a ciphertext CT, which contains an access policy A, and a private key SK, which is a private key for a set S of attributes. If the set S of attributes satisfies the access structure A then the algorithm will decrypt the cipher text and return a message M.

Encryption and Decryption

Encryption: A process of encoding a message so that its meaning is not obvious.

Decryption: The reverse process.

Encode (encipher) Vs Decode(decipher)

Encoding: The process of translating entire words or phrases other words or phrases.

Enciphering: Translating letters or symbols individually.

Encryption: The group term that covers both encoding and Enciphering.

Plaintext vs. Ciphertext

P(plaintext): The original form of a message

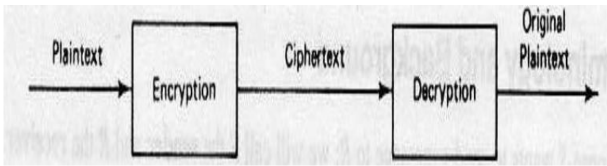
C(ciphertext): The encrypted form.

Basic operations

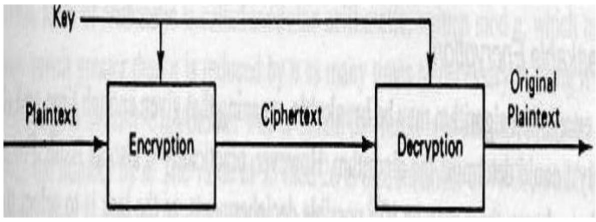
plaintext to ciphertext: encryption: $C = E(P)$

ciphertext to plaintext: decryption: $P = D(C)$

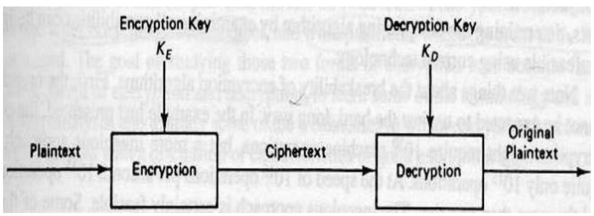
requirement: $P = D(E(P))$



Symmetric Cryptosystem: KE =KD



Asymmetric Cryptosystem: KE ^{1}KD



• Cryptography

Cryptography means hidden writing, the practice of using encryption to conceal text.

• Cryptanalysis

Cryptanalyst studies encryption and encrypted message, with the goal of finding the hidden meaning of the messages.

• Cryptology

It includes both cryptography and cryptanalysis.

• Cryptanalysis

– break an encryption

– Cryptanalyst can do any or all of three different things:

• Attempt to break a single message.

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• Attempt to recognize patterns in encrypted messages, in order to be able to break subsequent ones by applying a straightforward decryption algorithm.
• Attempt to find general weakness in an encryption algorithm, without necessarily having intercepted any messages.

• Breakable Encryption
An encryption algorithm may be breakable, meaning that given enough time and data, an analyst could determine the algorithm.

5. CONCLUSION

How to protect user's data privacy is a central question of cloud storage. With more mathematical tools, cryptographic schemes are getting more versatile and often involve multiple keys for a single application. In this article, we consider how to "compress" secret keys in public-key cryptosystems which support delegation of secret keys for different cipher text classes in cloud storage. No matter which one among the power set of classes, the delegate can always get an aggregate key of constant size. Our approach is more flexible than hierarchical key assignment which can only save spaces if all key-holders share a similar set of privileges.

A limitation in our work is the predefined bound of the number of maximum cipher text classes. In cloud storage, the number of cipher texts usually grows rapidly. So we have to reserve enough cipher text classes for the future extension. Otherwise, we need to expand the public-key as we described. Although the parameter can be downloaded with cipher texts, it would be better if its size is independent of the maximum number of cipher text classes. On the other hand, when one carries the delegated keys around in a mobile device without using special trusted hardware, the key is prompt to leakage, designing a leakage resilient cryptosystem yet allows efficient and flexible key delegation is also an interesting direction.

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BIOGRAPHIES

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