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A Hybrid Cloud Approach for Secure Authorized Deduplication

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ABSTRACT:
Data deduplication is one of important data compression techniques for eliminating duplicate copies of repeating data, and has been widely used in cloud storage to reduce the amount of storage space and save bandwidth. To protect the confidentiality of sensitive data while supporting deduplication, the convergent encryption technique has been proposed to encrypt the data before outsourcing. To better protect data security, this paper makes the first attempt to formally address the problem of authorized data deduplication. Different from traditional deduplication systems, the differential privileges of users are further considered in duplicate check besides the data itself. We also present several new deduplication constructions supporting authorized duplicate check in a hybrid cloud architecture. Security analysis demonstrates that our scheme is secure in terms of the definitions specified in the proposed security model. As a proof of concept, we implement a prototype of our proposed authorized duplicate check scheme and conduct test bed experiments using our prototype. We show that our proposed authorized duplicate check scheme incurs minimal overhead compared to normal operations.

INTRODUCTION:
Cloud computing provides seemingly unlimited "virtualized" resources to users as services across the whole Internet, while hiding platform and implementation details. Today's cloud service providers offer both highly available storage and massively parallel computing resources at relatively low costs. As cloud computing becomes prevalent, an increasing amount of data is being stored in the cloud and shared by users with specified privileges, which define the access rights of the stored data.

One critical challenge of cloud storage services is the management of the ever increasing volume of data. To make data management scalable in cloud computing, deduplication has been a well-known technique and has attracted more and more attention recently. Data deduplication is a specialized data compression technique for eliminating duplicate copies of repeating data in storage. The technique is used to improve storage utilization and can also be applied to network data transfers to reduce the number of bytes that must be sent. Instead of keeping multiple data copies with the same content, deduplication eliminates redundant data by keeping only one physical copy and referring other redundant data to that copy. Deduplication can take place at either the file level or the block level. For file level deduplication, it eliminates duplicate copies of the same file.

Deduplication can also take place at the block level, which eliminates duplicate blocks of data that occur in non-identical files. Cloud computing is an emerging service model that provides computation and storage resources on the Internet. One attractive functionality that cloud computing can offer is cloud storage. Individuals and enterprises are often required to remotely archive their data to avoid any information loss in case there are any hardware/software failures or unforeseen disasters. Instead of purchasing the needed storage media to keep data backups, individuals and enterprises can simply outsource their data backup services to the cloud service providers, which provide the necessary storage resources to host the data backups. While cloud storage is attractive, how to provide security guarantees for outsourced data becomes a rising concern. One major security challenge is to provide the property of assured deletion, i.e., data files are permanently inaccessible

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upon requests of deletion. Keeping data backups permanently is undesirable, assensitive information may be exposed in the future because of data breach or erroneous management of cloud operators. Thus, to avoid liabilities, enterprises and government agencies usually keep their backups for a finite number of years and request to delete (or destroy) the backups afterwards. For example, the US Congress is formulating the Internet Data Retention legislation in asking ISPs to retain data for two years, while in United Kingdom, companies are required to retain wages and salary records for six years. Although data deduplication brings a lot of benefits, security and privacy concerns arise as users' sensitive data are susceptible to both insider and outsider attacks. Traditional encryption, while providing data confidentiality, is incompatible with data deduplication. Specifically, traditional encryption requires different users to encrypt their data with their own keys. Thus, identical data copies of different users will lead to different ciphertexts, making deduplication impossible. Convergent encryption [1] has been proposed to enforce data confidentiality while making deduplication feasible.

It encrypts/ decrypts a data copy with a convergent key, which is obtained by computing the cryptographic hash value of the content of the data copy. After key generation and data encryption, users retain the keys and send the ciphertext to the cloud. Since the encryption operation is deterministic and is derived from the data content, identical data copies will generate the same convergent key and hence the same ciphertext. To prevent unauthorized access, a secure proof of ownership protocol [2] is also needed to provide the proof that the user indeed owns the same file when a duplicate is found. After the proof, subsequent users with the same file will be provided a pointer from the server without needing to upload the same file. A user can download the encrypted file with the pointer from the server, which can only be decrypted by the corresponding data owners with their convergent keys.

Thus, convergent encryption allows the cloud to perform deduplication on the ciphertexts and the proof of ownership prevents the unauthorized user to access the file.

EXISTING SYSTEM:

- Data deduplication systems, the private cloud is involved as a proxy to allow data owner/users to securely perform duplicate check with differential privileges.
- Such architecture is practical and has attracted much attention from researchers.
- The data owners only outsource their data storage by utilizing public cloud while the data operation is managed in private cloud.

DISADVANTAGES OF EXISTING SYSTEM:

- Traditional encryption, while providing data confidentiality, is incompatible with data deduplication.
- Identical data copies of different users will lead to different ciphertexts, making deduplication impossible.

PROPOSED SYSTEM:

In this paper, we enhance our system in security. Specifically, we present an advanced scheme to support stronger security by encrypting the file with differential privilege keys. In this way, the users without corresponding privileges cannot perform the duplicate check. Furthermore, such unauthorized users cannot decrypt the cipher text even collude with the S-CSP. Security analysis demonstrates that our system is secure in terms of the definitions specified in the proposed security model.

ADVANTAGES OF PROPOSED SYSTEM:

- The user is only allowed to perform the duplicate check for files marked with the corresponding privileges.
- We present an advanced scheme to support stronger security by encrypting the file with differential privilege keys.

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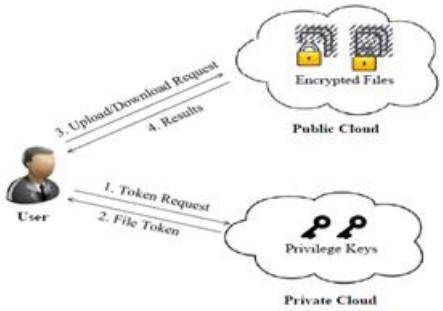
- Reduce the storage size of the tags for integrity check. To enhance the security of deduplication and protect the data confidentiality,

SYSTEM ARCHITECTURE:



MODULES DESCRIPTON:

Cloud Service Provider:

- ✓ In this module, we develop Cloud Service Provider module. This is an entity that provides a data storage service in public cloud.
- ✓ The S-CSP provides the data outsourcing service and stores data on behalf of the users.
- ✓ To reduce the storage cost, the S-CSP eliminates the storage of redundant data via deduplication and keeps only unique data.
- ✓ In this paper, we assume that S-CSP is always online and has abundant storage capacity and computation power.

Data Users Module:

- ✓ A user is an entity that wants to outsource data storage to the S-CSP and access the data later.
- ✓ In a storage system supporting deduplication, the user only uploads unique data but does not upload any duplicate data to save the upload bandwidth, which may be owned by the same user or different users.
- ✓ In the authorized deduplication system, each user is issued a set of privileges in the setup of the system. Each file is protected with the convergent encryption key and privilege keys to realize the authorized deduplication with differential privileges.

Private Cloud Module:

- ✓ Compared with the traditional deduplication architecture in cloud computing, this is a new entity introduced for facilitating user's secure usage of cloud service.
- ✓ Specifically, since the computing resources at data user/owner side are restricted and the public cloud is not fully trusted in practice, private cloud is able to provide data user/owner with an execution environment and infrastructure working as an interface between user and the public cloud.
- ✓ The private keys for the privileges are managed by the private cloud, who answers the file token requests from the users. The interface offered by the private cloud allows user to submit files and queries to be securely stored and computed respectively.

Secure Deduplication System:

- ✓ We consider several types of privacy we need protect, that is, i) unforgeability of duplicate-check token: There are two types of adversaries, that is, external adversary and internal adversary.
- ✓ As shown below, the external adversary can be viewed as an internal adversary without any privilege.
- ✓ If a user has privilege p, it requires that the adversary cannot forge and output a valid duplicate token with any other privilege p′ on any file F, where p does not match p′. Furthermore, it also requires that if the adversary does not make a request of token with its own privilege from private cloud server, it cannot forge and output a valid duplicate token with p on any F that has been queried.

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SCREEN SHOTS:

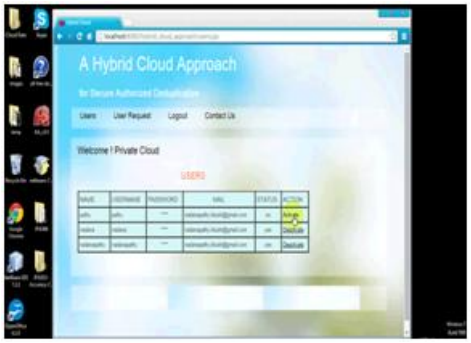
Home:

User Registration:

User Login:

Cloud Login:

View User Requests:



Token:

User:

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Upload File:

Download:

CONCLUSION:

In this paper, the notion of authorized data deduplication was proposed to protect the data security by including differential privileges of users in the duplicate check. We also presented several new deduplication constructions supporting authorized duplicate check in hybrid cloud architecture, in which the duplicate-check tokens of files are generated by the private cloud server with private keys. Security analysis demonstrates that our schemes are secure in terms of insider and outsider attacks specified in the proposed security model. As a proof of concept, we implemented a prototype of our proposed authorized duplicate check scheme and conduct testbed experiments on our prototype. We showed that our authorized duplicate check scheme incurs minimal overhead compared to convergent encryption and network transfer.

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