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A Survey on: Improved Reliability Using Secure Distributed Deduplication Systems

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ABSTRACT: For removing replication copies of data we use data deduplication process. As well as it is used in cloud storage to reduce memory space & upload bandwidth only one copy for each file stored in cloud that can be used by number of users. Deduplication process helps to improve storage reliability. One more challenge of privacy for sensitive data also arises when they are outsourced by users to cloud. The aim of this paper is to make the first attempt formalize the idea of distributed reliable deduplication system. In our proposed system we are going to develop new distributed deduplication systems which are highly reliable. In deduplication process data chunks are distributed across multiple cloud servers. The instead of using convergent encryption as in previous deduplication systems we use deterministic secret sharing scheme in distributed storage systems. So that we can achieve the required concepts for security that are data confidentiality and tag consistency. In the proposed security model, Security analysis demonstrates that our deduplication systems are secure.

KEYWORDS: Deduplication, reliability, distributed storage system, secret sharing, encryption

I.INTRODUCTION

Data deduplication is a technique for eliminating duplicate copies of data, and has been widely used in cloud storage to reduce storage space and upload bandwidth. Promising as it is, an arising challenge is to perform secure deduplication in cloud storage. Although convergent encryption has been extensively adopted for secure deduplication, a critical issue of making convergent encryption practical is to efficiently and reliably manage a huge number of convergent keys. One critical challenge of today's cloud storage services is the management of the ever-increasing volume of data. To make data management scalable deduplication we are use convergent Encryption for secure deduplication services. Businesses, especially startups, small and medium businesses (SMBs), are increasingly opting for outsourcing data and Computation to the Cloud. Today's commercial cloud storage services, such as Dropbox, Mozy, and Memopal, have been applying deduplication to user data to save maintenance cost. From a user's point of view, data outsourcing raises security and privacy concerns. We must trust thirdparty cloud providers to properly enforce confidentiality, integrity checking, and access control mechanisms against any insider and outsider attacks. However, deduplication, while improving storage and bandwidth efficiency, is compatible with Convergent key management. Specifically, traditional encryption requires different users to encrypt their data with their own keys. Many proposals have been made to secure remote data in the Cloud using encryption and standard access controls. It is fair to say all of the standard approaches have been demonstrated to fail from time to time for a variety of reasons, including insider Attacks, misconfigured services, faulty implementations, buggy code, and the creative construction of effective and Sophisticated attacks not envisioned by the implementers of security procedures. Building a trustworthy cloud computing environment is not enough, because accidents continue to happen, and when they do, and information gets lost, there is no way to get it back. One needs to prepare for such accidents. The basic idea is that we can limit the damage of stolen data if we decrease the value of that stolen information to the attacker. We can achieve this through a 'preventive' disinformation attack. We posit that secure deduplication services can be implemented given two additional security features:

1.1 User Behavior Profiling: It is expect that access to a user's information in the Cloud will exhibit a normal means of access. User profiling is a well-known technique that can be apply here to model how, when, and how much a



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user accesses their information in the Cloud. Such 'normal user' behavior can be continuously checked to determine whether abnormal access to a user's information is occurring. This method of behavior base security is commonly used in fraud detection applications. Such profiles would naturally include volumetric information, how many documents are typically read and how often. These simple user specific features can serve to detect abnormal Cloud access based partially upon the scale and scope of data transfer.

1.2 Decoys: Decoy information, such as decoy documents, honey files, honeypots, and various other bogus information can be generated on demand and serve as a means of detecting unauthorized access to information and to 'poison' the thief's infiltrated information. Serving decoys will confound and confuse an attacker into believing they have bogus useful information, when they have not. Whenever abnormal access to a cloud service is noticed, decoy information may be returned by the Cloud and delivered in such a way as to appear completely legitimate and normal. The true user, who is the owner of the information, would readily identify when decoy information is being returned by the Cloud, and hence could alter the Cloud's responses through a variety of means, such as challenge questions, to inform the Cloud security system that it has inaccurately detected an abnormal access. In the case where the access is correctly identified as an abnormal access, the Cloud security system would deliver unbounded amounts of bogus information to the adversary, thus securing the user's true data from unauthorized disclosure.

II. LITERATURE SURVEY

The Farsite distributed file system provides availability by replicating each file onto multiple desktop computers. Since this replication consumes significant storage space, [1] it is important to reclaim used space where possible. Measurement of over 500 desktop file systems shows that nearly half of all consumed space is occupied by duplicate files. We present a mechanism to reclaim space from this incidental duplication to make it available for controlled file replication. Our mechanism includes 1) convergent encryption, which enables duplicate files to coalesce into the space of a single file, even if the files are encrypted with different users' keys, and 2) SALAD, a SelfArranging, Lossy, Associative Database for aggregating file content and location information in a decentralized, scalable, fault-tolerant manner. Large-scale simulation experiments show that the duplicate-file coalescing system is scalable, highly effective, and fault-tolerant [4].

Cloud storage service providers such as Dropbox, Mozy, and others perform deduplication to save space by only storing one copy of each file uploaded [5]. Should clients conventionally encrypt their files, however, savings are lost. Message-locked encryption (the most prominent manifestation of which is convergent encryption) resolves this tension. However it is inherently subject to brute-force attacks that can recover files falling into a known set. We propose an architecture that provides secure deduplicated storage resisting brute-force attacks, and realize it in a system called DupLESS. In DupLESS, clients encrypt under message-based keys obtained from a key-server via an oblivious PRF protocol. It enables clients to store encrypted data with an existing service, have the service perform deduplication on their behalf, and yet achieves strong confidentiality guarantees. We show that encryption for deduplicated storage can achieve performance and space savings close to that of using the storage service with plaintext data [5].

An Information Dispersal Algorithm (IDA) is developed that breaks a file F of length L into n pieces F_i , $1 \leq i \leq n$, each of length l , $l = L/n$, so that every m pieces suffice for reconstructing F [9]. Dispersal and reconstruction are computationally efficient. The sum of the lengths of F_i is $(n/m) \cdot L$. Since n/m can be chosen to be close to 1, the IDA is space efficient. IDA has numerous applications to secure and reliable storage of information in computer networks and even on single disks, to fault-tolerant and efficient transmission of information in networks, and to communications between processors in parallel computers. For the latter problem provably time-efficient and highly fault-tolerant routing on the n -cube is achieved, using just constant size buffers. Categories and Subject Descriptors: E.4 [Coding and Information Theory]: nonsecret encoding schemes [9].

Data deduplication is a technique for eliminating duplicate copies of data, and has been widely used in cloud storage to reduce storage space and upload bandwidth. Promising as it is, an arising challenge is to perform secure deduplication



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in cloud storage [11]. Although convergent encryption has been extensively adopted for secure deduplication, a critical issue of making convergent encryption practical is to efficiently and reliably manage a huge number of convergent keys. This paper makes the first attempt to formally address the problem of achieving efficient and reliable key management in secure deduplication. We first introduce a baseline approach in which each user holds an independent master key for encrypting the convergent keys and outsourcing them to the cloud. However, such a baseline key management scheme generates an enormous number of keys with the increasing number of users and requires users to dedicatedly protect the master keys. To this end, we propose Dekey, a new construction in which users do not need to manage any keys on their own but instead securely distribute the convergent key shares across multiple servers. Security analysis demonstrates that Dekey is secure in terms of the definitions specified in the proposed security model. As a proof of concept, we implement Dekey using the Ramp secret sharing scheme and demonstrate that Dekey incurs limited overhead in realistic environments [11].

Cloud storage systems are becoming increasingly popular. A promising technology that keeps their cost down is deduplication, which stores only a single copy of repeating data [12]. Client-side deduplication attempts to identify deduplication opportunities already at the client and save the bandwidth of uploading copies of existing files to the server. In this work we identify attacks that exploit client-side deduplication, allowing an attacker to gain access to arbitrary-size files of other users based on very small hash signatures of these files. More specifically, an attacker who knows the hash signature of a file can convince the storage service that it owns that file; hence the server lets the attacker download the entire file. (In parallel to our work, a subset of these attacks was recently introduced in the wild with respect to the Dropbox file synchronization service.) To overcome such attacks, we introduce the notion of proofs-of-ownership (PoWs), which lets a client efficiently prove to a server that that the client holds a file, rather than just some short information about it. We formalize the concept of proof-of-ownership, under rigorous security definitions, and rigorous efficiency requirements of Petabyte scale storage systems. We then present solutions based on Merkle trees and specific encodings, and analyse their security. We implemented one variant of the scheme. Our performance measurements indicate that the scheme incurs only a small overhead compared to naive client-side deduplication [12].

III. EXISTING SYSTEM

A number of deduplication systems have been proposed based on various deduplication strategies such as client-side or server-side deduplications, file-level or block-level deduplications. Bellare et al. formalized this primitive as message-locked encryption, and explored its application in space efficient secure outsourced storage. There are also several implementations of convergent implementations of different convergent encryption variants for secure deduplication. Li addressed the key-management issue in block-level deduplication by distributing these keys across multiple servers after encrypting the files Bellare et al. showed how to protect data confidentiality by transforming the predictable message into a unpredictable message. [1]

Disadvantages of Existing System:

- ✓ Data reliability is actually a very critical issue in a deduplication storage system because there is only one copy for each file stored in the server shared by all the owners.
- ✓ Most of the previous deduplication systems have only been considered in a single-server setting.
- ✓ The traditional deduplication methods cannot be directly extended and applied in distributed and multi-server systems.

IV. PROPOSED ALGORITHM

System Architecture:

In this paper, we show how to design secure deduplication systems with higher reliability in cloud computing. We introduce the distributed cloud storage servers into deduplication systems to provide better fault tolerance. To further protect data confidentiality, the secret sharing technique is utilized, which is also compatible with the distributed storage systems. In more details, a file is first split and encoded into fragments by using the technique of secret sharing, instead of encryption mechanisms. These shares will be distributed across multiple independent storage servers. Furthermore, to support deduplication, a short cryptographic hash value of the content will also be computed and sent

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to each storage server as the fingerprint of the fragment stored at each server. Only the data owner who first uploads the data is required to compute and distribute such secret shares, while all following users who own the same data copy do not need to compute and store these shares any more. To recover data copies, users must access a minimum number of storage servers through authentication and obtain the secret shares to reconstruct the data. In other words, the secret shares of data will only be accessible by the authorized users who own the corresponding data copy. Four new secure deduplication systems are proposed to provide efficient deduplication with high reliability for file-level and block-level deduplication, respectively. The secret splitting technique, instead of traditional encryption methods, is utilized to protect data confidentiality. Specifically, data are split into fragments by using secure secret sharing schemes and stored at different servers [1].

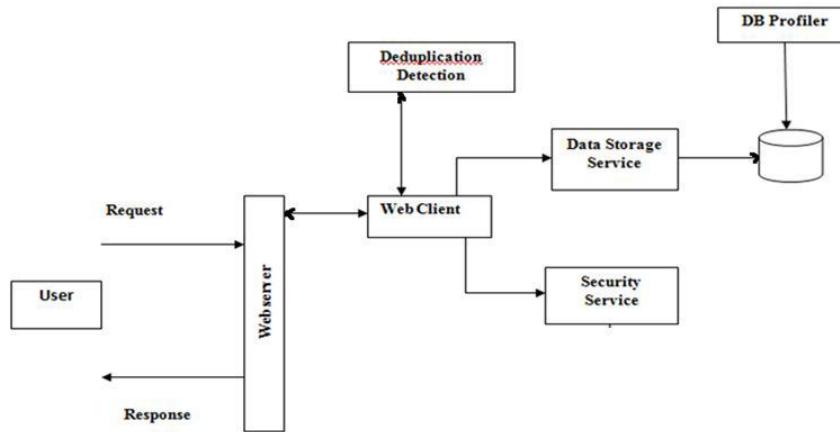


Figure 1: System Architecture of Secure deduplication

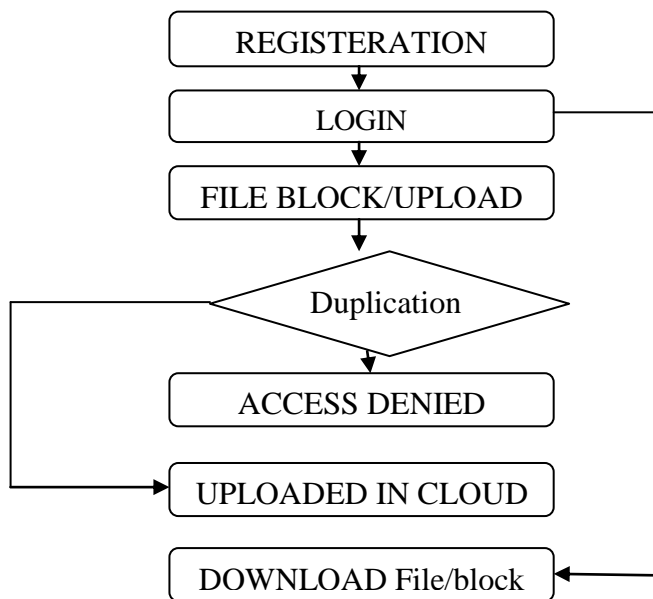


Figure 2: Data Flow Diagram of Secure deduplication



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Modules:

System Model:

- In this first module, we develop two entities: User and Secure-Cloud Service Provide. User: The 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. Furthermore, the fault tolerance is required by users in the system to provide higher reliability.

S-CSP:

- The S-CSP is an entity that provides the outsourcing data storage service for the users. In the deduplication system, when users own and store the same content, the S-CSP will only store a single copy of these files and retain only unique data. A deduplication technique, on the other hand, can reduce the storage cost at the server side and save the upload bandwidth at the user side. For fault tolerance and confidentiality of data storage, we consider a quorum of S-CSPs, each being an independent entity. The user data is distributed across multiple S-CSPs.

Data Deduplication:

- Data Deduplication involves finding and removing of duplicate data's without considering its fidelity. Here the goal is to store more data's with less bandwidth. Files are uploaded to the CSP and only the Data owners can view and download it. The Security requirements are also achieved by Secret Sharing Scheme. Secret Sharing Scheme uses two algorithms, share and recover. Data's are uploaded both file and block level and the finding duplication is also in the same process. This is made possible by finding duplicate chunks and maintaining a single copy of chunks.

File Level Deduplication Systems:

- To support efficient duplicate check, tags for each file will be computed and are sent to S-CSPs. To upload a file F , the user interacts with S-CSPs to perform the deduplication. More precisely, the user firstly computes and sends the file tag $\phi F = \text{TagGen}(F)$ to S-CSPs for the file duplicate check. If a duplicate is found the user computes and sends it to a server via a secure channel. Otherwise if no duplicate is found the process continues, i.e. secret sharing scheme runs and the user will upload a file to CSP. To download a file the user will use the secret shares and download it from the SCSP's. This approach provides fault tolerance and allows the user to remain accessible even if any limited subsets of storage servers fail.

Block Level Deduplication Systems:

- In this module we will show to achieve fine grained block-level distributed deduplication systems. In a block-level deduplication system, the user also needs to firstly perform the file-level deduplication before uploading his file. If no duplicate is found, the user divides this file into blocks and performs block-level deduplication. The System setup is similar to the file level deduplication except the parameter changes. To download a block the user gets the secret shares and downloads the blocks from CSP.

Advantage:

1. Distinguishing feature of our proposal is that data integrity, including tag consistency, can be achieved.
2. To our knowledge, no existing work on secure deduplication can properly address the reliability and tag consistency problem in distributed storage systems.
3. Our proposed constructions support both file-level and block-level deduplications.
4. Security analysis demonstrates that the proposed deduplication systems are secure in terms of the definitions specified in the proposed security model. In more details, confidentiality, reliability and integrity can be achieved in our proposed system. Two kinds of collusion attacks are considered in our solutions. These are the collusion attack on the data and the collusion attack against servers. In particular, the data remains secure even if the adversary controls a limited number of storage servers.



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5. We implement our deduplication systems using the Ramp secret sharing scheme that enables high reliability and confidentiality levels. Our evaluation results demonstrate that the new proposed constructions are efficient and the redundancies are optimized and comparable with the other storage system supporting the same level of reliability.

V.CONCLUSION AND FUTURE WORK

We implement the secure distributed deduplication systems to improve the reliability of data while achieving the secret of the clients outsourced data. Four constructions were proposed to support file-level and fine-grained block-level data deduplication. The security of tag consistency and integrity were achieved. We implemented our deduplication systems using the Ramp secret sharing scheme and demonstrated that it incurs small encoding/decoding overhead compared to the network transmission overhead in regular upload/download operations.

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