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A Comparative on Various Privacy Preserving Algorithms in Cloud Environment

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ABSTRACT: In cloud computing paradigm it is not only used to store the user's data and also allows the users to share the data among them. Sometimes the integrity of cloud data is loss due to the existence of hardware/software failures and human errors. To prevent this problem several mechanisms have been designed to allow both data owners and public verifiers to efficiently audit cloud data integrity without retrieving the entire data from the cloud server. However, public auditing on the integrity of shared data with these existing mechanisms will inevitably reveal confidential information identity privacy to public verifiers. In this paper, we undergo a survey on various privacy-preserving mechanism that supports public auditing on shared data stored in the cloud. In particular, we exploit ring signatures to compute verification metadata needed to audit the correctness of shared data.

KEYWORDS: Public auditing, privacy-preserving, shared data, cloud computing

I. INTRODUCTION

CLOUD computing has been envisioned as the next generation information technology (IT) architecture for enterprises, due to its long list of unprecedented advantages in the IT history: on-demand self-service, ubiquitous network access, location independent resource pooling, rapid resource elasticity, usage-based pricing and transference of risk . From users' perspective, including both individuals and IT enterprises, storing data remotely to the cloud in a flexible on-demand manner brings appealing benefits: relief of the burden for storage management, universal data access with location independence, and avoidance of capital expenditure on hardware, software, and personnel maintenances, etc. While cloud computing makes these advantages more appealing than ever, it also brings new and challenging security threats toward users' outsourced data. Since cloud service providers (CSP) are separate administrative entities, data outsourcing is actually relinquishing user's ultimate control over the fate of their data. As a result, the correctness of the data in the cloud is being put at risk due to the following reasons. First of all, although the infrastructures under the cloud are much more powerful and reliable than personal computing devices, they are still facing the broad range of both internal and external threats for data integrity. Examples of outages and security breaches of noteworthy cloud services appear from time to time. Second, there do exist various motivations for CSP to behave unfaithfully toward the cloud users regarding their outsourced data status. For examples, CSP might reclaim storage for monetary reasons by discarding data that have not been or are rarely accessed, or even hide data loss incidents to maintain a reputation.

We consider a cloud data storage service involving three different entities: the cloud user, who has large amount of data files to be stored in the cloud; the cloud server, which is managed by the cloud service provider to provide data storage service and has significant storage. space and computation resources (we will not differentiate CS and CSP hereafter); the third-party auditor, who has expertise and capabilities that cloud users do not have and is trusted to assess the cloud storage service reliability on behalf of the user upon request. Users rely on the CS for cloud data storage and maintenance. They may also dynamically interact with the CS to access and update their stored data for various application purposes. As users no longer possess their data locally, it is of critical importance for users to ensure that their data are being correctly stored and maintained. In short, although outsourcing data to the cloud is economically attractive for long-term large-scale storage, it does not immediately offer any guarantee on data integrity

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and availability. This problem, if not properly addressed, may impede the success of cloud architecture. To save the computation resource as well as the online burden potentially brought by the periodic storage correctness verification, cloud users may resort to TPA for ensuring the storage integrity of their outsourced data. Public audit ability allows an external party, in addition to the user himself, to verify the correctness of remotely stored data. However, most of these schemes, do not consider the privacy protection of users' data against external auditors.

II. ANALYSIS OF VARIOUS PRIVACY PRESERVING ALGORITHMS

Title: Enabling Public Auditability and Data Dynamics for Storage Security in Cloud Computing
Author: Qian Wang, Cong Wang, Wenjing Lou
Year : 2011
Description: Cloud Computing has been envisioned as the next-generation architecture of IT Enterprise. It moves the application software and databases to the centralized large data centers, where the management of the data and services may not be fully trustworthy. This unique paradigm brings about many new security challenges, which have not been well understood. This work studies the problem of ensuring the integrity of data storage in Cloud Computing. In particular, we consider the task of allowing a third party auditor (TPA), on behalf of the cloud client, to verify the integrity of the dynamic data stored in the cloud. The introduction of TPA eliminates the involvement of the client through the auditing of whether his data stored in the cloud is indeed intact, which can be important in achieving economies of scale for Cloud Computing. The support for data dynamics via the most general forms of data operation, such as block modification, insertion and deletion, is also a significant step toward practicality, since services in Cloud Computing are not limited to archive or backup data only. While prior works on ensuring remote data integrity often lacks the support of either public auditability or dynamic data operations, this paper achieves both. We first identify the difficulties and potential security
problems of direct extensions with fully dynamic data updates from prior works and then show how to construct an elegant verification scheme for the seamless integration of these two salient features in our protocol design. In particular, to achieve efficient data dynamics, we improve the existing proof of storage models by manipulating the classic Merkle Hash Tree construction for block tag authentication. To support efficient handling of multiple auditing tasks, we further explore the technique of bilinear aggregate signature to extend our main result into a multi-user setting, where TPA can perform multiple auditing tasks simultaneously. Extensive security and performance analysis show that the proposed schemes are highly efficient and provably secure.

Title: Provable Data Possession at Untrusted Stores
Author: Giuseppe Ateniese, Randal Burns
Year : 2007
Description: We introduce a model for provable data possession (PDP) that allows a client that has stored data at an untrusted server to verify that the server possesses the original data without retrieving it. The model generates probabilistic proofs of possession by sampling random sets of blocks from the server, which drastically reduces I/O costs. The client maintains a constant amount of metadata to verify the proof. The challenge/response protocol transmits a small, constant amount of data, which minimizes network communication. Thus, the PDP model for remote data checking supports large data sets in widely-distributed storage systems. We present two provably-secure PDP schemes that are more efficient than previous solutions, even when compared with schemes that achieve weaker guarantees. In particular, the overhead at the server is low (or even constant), as opposed to linear in the size of the data. Experiments using our implementation verify the practicality of PDP and reveal that the performance of PDP is bounded by disk I/O and not by cryptographic computation.

Title: Privacy-Preserving Audit and Extraction of Digital Contents
Author: Mehul A. Shah, Ram Swaminathan
Year : 2008
Description: A growing number of online services, such as Google, Yahoo!, and Amazon, are starting to charge users for their storage. Customers often use these services to store valuable data such as email, family photos and videos, and disk backups. Today, a customer must entirely trust such external services to maintain the integrity of hosted data and

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return it intact. Unfortunately, no service is infallible. To make storage services accountable for data loss, we present protocols that allow a third party auditor to periodically verify the data stored by a service and assist in returning the data intact to the customer. Most importantly, our protocols are privacy-preserving, in that they never reveal the data contents to the auditor. Our solution removes the burden of verification from the customer, alleviates both the customer's and storage service's fear of data leakage, and provides a method for independent arbitration of data retention contracts.

Title: Toward Publicly Auditable Secure Cloud Data Storage Services
Author: Cong Wang and Kui Ren
Year : 2010
Description: Cloud computing is the long dreamed vision of computing as a utility, where data owners can remotely store their data in the cloud to enjoy on-demand high-quality applications and services from a shared pool of configurable computing resources. While data outsourcing relieves the owners of the burden of local data storage and maintenance, it also eliminates their physical control of storage dependability and security, which traditionally has been expected by both enterprises and individuals with high service-level requirements. In order to facilitate rapid deployment of cloud data storage service and regain security assurances with outsourced data dependability, efficient methods that enable on-demand data correctness verification on behalf of cloud data owners have to be designed. In this article we propose that publicly auditable cloud data storage is able to help this nascent cloud economy become fully established. With public auditability, a trusted entity with expertise and capabilities data owners do not possess can be delegated as an external audit party to assess the risk of outsourced data when needed. Such an
auditing service not only helps save data owners' computation resources but also provides a transparent yet cost-effective method for data owners to gain trust in the cloud. We describe approaches and system requirements that should be brought into consideration, and outline challenges that need to be resolved for such a publicly auditable secure cloud storage service to become a reality.

Title: Scalable and Efficient Provable Data Possession
Author: Giuseppe Ateniese, Roberto Di Pietro
Year : 2005
Description: Storage outsourcing is a rising trend which prompts a number of interesting security issues, many of which have been extensively investigated in the past. However, Provable Data Possession (PDP) is a topic that has only recently appeared in the research literature. The main issue is how to frequently, efficiently and securely verify that a storage server is faithfully storing its client's (potentially very large) outsourced data. The storage server is assumed to be untrusted in terms of both security and reliability. (In other words, it might maliciously or accidentally erase hosted data; it might also relegate it to slow or off-line storage.) The problem is exacerbated by the client being a small computing device with limited resources. Prior work has addressed this problem using either public key cryptography or requiring the client to outsource its data in encrypted form.

Title: Auditing to Keep Online Storage Services Honest
Author: Mehul A. Shah, Mary Baker
Year : 2007
Description: A growing number of online service provider's offer to store customers' photos, email, _le system backups, and other digital assets. Currently, customers cannot make informed decisions about the risk of losing data stored with any particular service provider, reducing their incentive to rely on these services. We argue that third party *auditing* is important in creating an online service oriented economy, because it allows customers to evaluate risks, and it increases the efficiency of insurance based risk mitigation. We describe approaches and system hooks that support both *internal* and *external* auditing of online storage services, describe motivations for
service providers and auditors to adopt these approaches, and list challenges that need to be resolved for such auditing to become a reality.

Title: Efficient Provable Data Possession for Hybrid Clouds
Author: Yan Zhu, Huaixi Wang
Year : 2010

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Description: Provable data possession is a technique for ensuring the integrity of data in outsourcing storage service. In this paper, we propose a cooperative provable data possession scheme in hybrid clouds to support scalability of service and data migration, in which we consider the existence of multiple cloud service providers to cooperatively store and maintain
the clients' data. Our experiments show that the verification of our scheme requires a small, constant amount of overhead, which minimizes communication complexity.

III. CONCLUSION

We proposed a privacy-preserving public auditing system for data storage security in cloud computing. We utilize the homomorphic linear authenticator and random masking to guarantee that the TPA would not learn any knowledge about the data content stored on the cloud server during the efficient auditing process, which not only eliminates the burden of cloud user from the tedious and possibly expensive auditing task, but also alleviates the users' fear of their outsourced data leakage.

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