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An efficient processfor third party auditing for the cloud storage system with enhanced User data privacy protection

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Abstract:

Cloud computing is computing in which large groups of remote servers are networked to allow centralized data storage and online access to computer services or resources. Cloud computing relies on sharing of resources to achieve coherence and economies of scale, similar to a utility (like the electricity grid) over a network.The cloud must have to ensure data integrity and security of data of user.

To maintain to overkill this issuehere, we are giving public auditing process for cloud storage that users can make use of a third-partyauditor (TPA) to check the integrity of data.

Not only verification of data integrity, the proposed system alsosupports data dynamics. The work that has been done in this line lacks data dynamics and true publicauditability.

The auditing task monitors data modifications, insertions and deletions. The proposed system iscapable of supporting public auditability, data dynamics and Multiple TPA are used for the auditing process.We also extend our concept to ring signatures in which HARS scheme is used. Merkle Hash Tree is used toimprove block level authentication.

Keywords:

Privacy Preserving, Public Auditing, Watermarking, TPA, Securit, Cloud Computing

Introduction:

Cloud computing security or, more simply, cloud security is an evolving sub-domain of computer security, network security, and, more broadly, information security. It refers to a broad set of policies, technologies, and controls deployed to protect data, applications, and the associated infrastructure of cloud computing.

Security issues associated with the cloud:

Organizations use the Cloud in a variety of different service models (SaaS, PaaS, and IaaS) and deployment models (Private, Public, Hybrid, and Community). There are a number of security issues/concerns associated with cloud computing but these issues fall into two broad categories: security issues faced by cloud providers (organizations providing software-, platform-, or infrastructure-as-a-service via the cloud) and security issues faced by their customers (companies or organizations who host applications or store data on the on the cloud).

The responsibility goes both ways, however: the provider must ensure that their infrastructure is secure and that their clients' data and applications are protected while the user must take measures to fortify their application and use strong passwords and authentication measures. When an organization elects to store data or host applications on the public cloud, it loses its ability to have physical access to the servers hosting its information. As a result, potentially business sensitive and confidential data is at risk from insider attacks.

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According to a recent Cloud Security Alliance Report, insider attacks are the third biggest threat in cloud computing. Therefore, Cloud Service providers must ensure that thorough background checks are conducted for employees who have physical access to the servers in the data center. Additionally, data centers must be frequently monitored for suspicious activity.

In order to conserve resources, cut costs, and maintain efficiency, Cloud Service Providers often store more than one customer's data on the same server. As a result there is a chance that one user's private data can by viewed by other users (possibly even competitors). To handle such sensitive situations, cloud service providers should ensure proper data isolation and logical storage segregation.

The extensive use of virtualization in implementing cloud infrastructure brings unique security concerns for customers or tenants of a public cloud service. Virtualization alters the relationship between the OS and underlying hardware - be it computing, storage or even networking. This introduces an additional layer - virtualization - that itself must be properly configured, managed and secured. Specific concerns include the potential to compromise the virtualization software, or "hypervisor". While these concerns are largely theoretical, they do exist. For example, a breach in the administrator workstation with the management software of the virtualization software can cause the whole datacenter to go down or be reconfigured to an attacker's liking.

Some security and privacy issues that need to be considered are as follows
1) Authentication: Only authorized user can access data inthe cloud
2) Correctness of data: This is the way through whichuser will get the confirmation that the data stored in thecloud is secure
3) Availability: The cloud data should be easily available and accessible without any burden. The user should access the cloud data as if he is accessing local data
4) No storage Overhead and easy maintenance: User doesn't have to worry about the storage requirement &maintenance of the data on a cloud
5) No data Leakage: The user data stored on a cloud can accessed by only authorize the user or owner. So all the contents are accessible by only authorize the user.
6) No Data Loss: Provider may hide data loss on a cloud for the user to maintain their reputation.

Compliance & Audits in Cloud:

Numerous laws and regulations pertain to the storage and use of data. In the US these include privacy or data protection laws, Payment Card Industry - Data Security Standard (PCI DSS), the Health Insurance Portability and Accountability Act (HIPAA), the Sarbanes-Oxley Act, the Federal Information Security Management Act of 2002 (FISMA), and Children's Online Privacy Protection Act of 1998, among others.

Similar laws may apply in different legal jurisdictions and may differ quite markedly from those enforced in the US. Cloud service users may often need to be aware of the legal and regulatory differences between the jurisdictions. For example data stored by a Cloud Service Provider may be located in, say, Singapore and mirrored in the US. Many of these regulations mandate particular controls (such as strong access controls and audit trails) and require regular reporting. Cloud customers must ensure that their cloud providers adequately fulfil such requirements as appropriate, enabling them to comply with their obligations since, to a large extent, they remain accountable.

Business continuity and data recovery:

Cloud providers have business continuity and data recovery plans in place to ensure that service can be maintained in case of a disaster or an emergency and that any data loss will be recovered. These plans may be shared with and reviewed by their customers, ideally dovetailing with the customers' own continuity arrangements. Joint continuity exercises may be appropriate, simulating a major Internet or electricity supply failure for instance.

Logs and audit trails:

In addition to producing logs and audit trails, cloud providers work with their customers to ensure that these logs and audit trails are properly secured, maintained for as long as the customer requires, and are accessible for the purposes of forensic investigation (e.g., eDiscovery).

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Unique compliance requirements:

In addition to the requirements to which customers are subject, the data centers used by cloud providers may also be subject to compliance requirements. Using a cloud service provider (CSP) can lead to additional security concerns around data jurisdiction since customer or tenant data may not remain on the same system, or in the same data center or even within the same provider's cloud.

LITERATURE SURVEY:

A. MAC Based Solution:

It is used to authenticate the data. In this, userupload data blocks and MAC to CS provide its secret key SKto TPA. The TPA will randomly retrieve data blocks & Macuses secret key to check correctness of stored data on thecloud. Problems with this system are listed below as:

- It introduces additional online burden to users due to limited use (i.e. Bounded usage) and stateful verification.
- Communication & computation complexity
- TPA requires knowledge of data blocks for verification
- Limitation on data files to be audited as secret keys arefixed
- After usages of all possible secret keys, the user has todownload all the data to recomputed MAC & republish it on CS.
- TPA should maintain & update states for TPA which is very difficult
- It supports only for static data not for dynamic data.

HLA Based Solution:

It supports efficient public auditing without retrieving data block.

It is aggregated and required constant bandwidth. It is possible to compute an aggregate HLA which authenticates alinear combination of the individual data blocks.

Privacy Preserving Public Auditing Proposed by Cong Wang Public auditing allows TPA along with user to check theintegrity of the outsourced data stored on a cloud & PrivacyPreserving allows TPA to do auditing without requesting forlocal copy of the data. Through this scheme, TPA canaudit the data and cloud data privacy is maintained.

It is divided into two parts as setup phase and audit phase.

1) Setup Phase: Public and secret parameters areinitialized by using keygen and data files f arepreprocesses by using singen to generate verificationmetadata at CS & delete its local copy. Inpreprocessing user can alter data files F.

2) Audit Phase: TPA issues an audit message to CS. The CS will derive a response message by executingGenproof. TPA verifies the response using F and itsverification metadata.

TPA is stateless i.e. no need to maintain or update the state information of audit phase. Public key based homomorphic linear authentication with random masking technique is used to achieve privacy preserving public auditing. TPA checks the integrity of the outsourced data stored on a cloud withoutaccessing actual contents. Existing research work of proof ofretrievability (PoR) or Proofs of Data Possession (PDP)technique doesn't consider data privacy problem. PDP schemefirst proposed by Ateniese et al. used to detect large amountcorruption in outsourced data.

It uses RSA basedHomomorphic authentication for auditing the cloud data andrandomly sampling a few blocks of files. A Second techniqueproposed by Juels as Proofs of retrievability (PoR) allows userto retrieve files without any data loss or corruptions. It usesspot checking & error correcting codes are used to ensure both"Possession" and "Retrievability".
To achieve Zeroknowledge privacy, researcher proposed AggregatableSignature Based Broadcast (ASBB).It provides completeness, privacy and soundness. It uses 3

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algorithms as Keygen, Gentag and Audit.

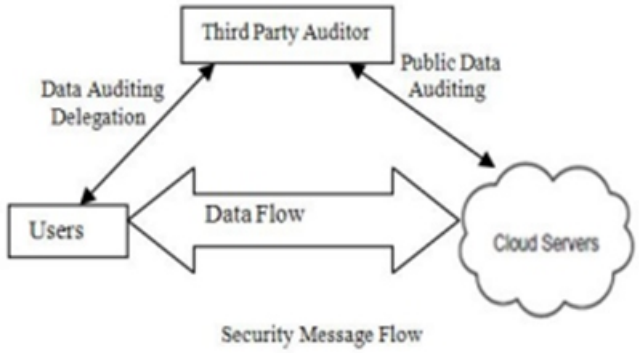
Using Virtual Machine:

AbhishekMohta proposed Virtual machines which uses:

RSA algorithm, for client data/file encryption and decryptions. It also uses SHA 512 algorithm which makes messagedigest and check the data integrity. The Digital signature isused as an identity measure for client or data owner. It solvesthe problem of integrity, unauthorized access, privacy andconsistency.

EXISTING SYSTEM:

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.



Architecture of Cloud Data storage service

DISADVANTAGES OF EXISTING SYSTEM:

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 and availability. This problem, if not properly addressed, may impede the success of cloud architecture.As users no longer physically possess the storage of their data, traditional cryptographic primitives for the purpose of data security protection cannot be directly adopted.

In particular, simply downloading all the data for its integrity verification is not a practical solution due to the expensiveness in I/O and transmission cost across the network. Besides, it is often insufficient to detect the data corruption only when accessing the data, as it does not give users correctness assurance for those unaccessed data and might be too late to recover the data loss or damage.

PROPOSED SYSTEM:

To fully ensure the data integrity and save the cloud users' computation resources as well as online burden, it is of critical importance to enable public auditing service for cloud data storage, so that users may resort to an independent third party auditor (TPA) to audit the outsourced data when needed. The TPA, who has expertise and capabilities that users do not, can periodically check the integrity of all the data stored in the cloud on behalf of the users, which provides a much more easier and affordable way for the users to ensure their storage correctness in the cloud. Moreover, in addition to help users to evaluate the risk of their subscribed cloud data services, the audit result from TPA would also be beneficial for the cloud service providers to improve their cloud based service platform, and evenserve for independent arbitration purposes. In a word, enabling public auditing services will play an important role for this nascent cloud economy to becomefully established, where users will need ways to assess risk and gain trust in the cloud.

ADVANTAGES OF PROPOSED SYSTEM:

1) We motivate the public auditing system of data storage security in Cloud Computing and provide a privacy-preserving auditing protocol. Our scheme enables an external auditor to audit user's cloud data without learning the data content.

2) To the best of our knowledge, our scheme is the first to support scalable and efficient privacy preserving public storage auditing in Cloud. Specifically, our scheme achieves batch auditing where multiple delegated auditing tasks from different users can be performed simultaneously by the TPA in a privacy-preserving manner.

3) We prove the security and justify the performance of our proposed schemes through concrete experiments and comparisons with the state-of-the-art.

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In this there are many users upload their data those users are called as Data owners or data players. There is a trusted member who verifies the files in cloud service so called as Auditor or verifier. There are two types of users such as Public users and personal users. Public users are monitored by auditors and private users are monitored by data owners directly.

Data owner encrypt data using symmetric key cryptographic algorithm as shown below:

Encryption Algorithm:

Step 1: Generate the ASCII value of the letter

Step 2: Generate the corresponding binary value of it.[Binary value should be 8 digits (no matter how muchthe length of it, we should represent it in 8 digits.(28=256). e.g. for decimal 32 binary number should be00100000 (underlined zeros are required)]

Step 3: Reverse the 8 digit's binary number

Step 4: Take a 4 digits divisor (>=1000) as the Key

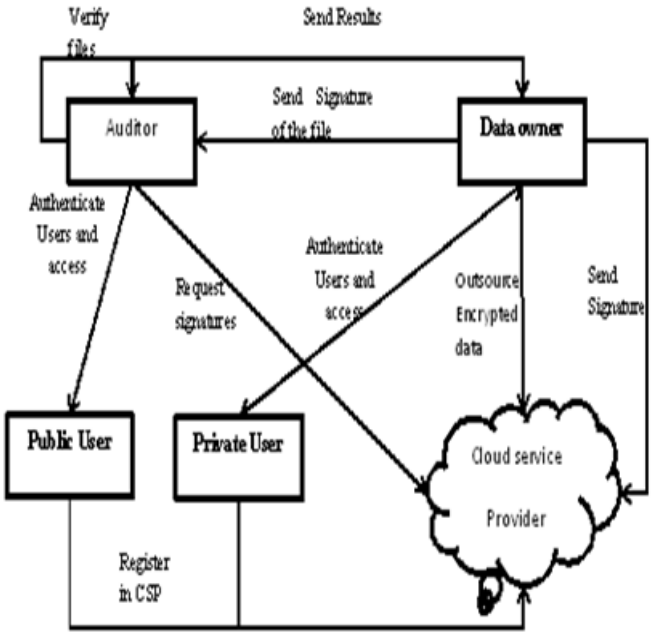
Step 5: Divide the reversed number with the divisor

Step 6: Store the remainder in first 3 digits &quotientin next 5 digits (remainder and quotient wouldn't bemore than 3 digits and 5 digits long respectively. If anyof these are less than 3 and 5 digits respectively weneed to add required number of 0s (zeros) in the lefthand side. So, this would be the ciphertext i.e. encryptedtext.

Now store the remainder in first 3 digits & quotient in next 5 digits.

[Since it will works character by character that is why spaces, commas, each & every character will be treated as one single character & we have to apply the above algorithm for every character.]

For user authentication we used Schnorr Digital Signature Scheme as shown below:



Signature Generation Algorithm:

The message-dependent part of the signature generation requires multiplying a 2n-bit integer with an n-bit integer.

The scheme is based on using a prime modulus P, with P-1 having a prime factor q of appropriate size; that is, P-1=(mod q). Typically, we use P~ 21024 and q=2160. Thus, P is a 1024-bit number, and is a 160-bit number, which is also the length of the SHA-1 hash value.The first part of this scheme is the generation of a private/public key pair, which consists of the following steps.

1. Choose primes and, such that is a prime factor of P-1.

2. Choose an integer, such that αq=1 mod P. The values, and comprise a global public key that can be common to a group of users.

3. Choose a random integer s with 0<s<q. This is the user's private key.

4. Calculate v=a-z .This is the user's public key.

A user with private key and public key generates a signature as follows.

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1. Choose a random integer with and compute 0<r<q and compute x=ax mod P. This computation is a pre-processing stage independent of the message M to be signed.

2. Concatenate the message with x and hash the result to compute the value e:

e=H(M||x)

3. Compute y = (r + se)mod q. The signature consists of the pair (e, y).

Any other user can verify the signature as follows.

1. Compute .x'=ayve mod p.

2. Verify that e=H(M|| x')

To see that the verification works, observe that
X' = ayve =aya-se=ay-se=ay=x(modp)
Hence, H(M||x')=H(M||x).

Advantages:

1. The Algorithm is very simple in nature

2. There are two reverse operations present in this algorithm which would make it more secured

3. CRC checking in receiving ends is easier

4. For a small amount of data this algorithm will work very smoothly.

According to our architecture data owner sends signature to auditor and sends encrypted data to cloud service.

At the time of verification the data auditor verifies the cloud service signature and data owner signature and sends result to data owner.

CONCLUSIONS:

In this paper, we proposed watermarking technique for Privacy Preserving Public Auditing for cloud data storage security. Cloud computing security is a major issue that needsto be considered.

Using TPA, We can verify the correctnessand integrity of data stored on a cloud. It uses public keybased homomorphic linear authentication (HLA) protocolwith random masking to achieve privacy preserving datasecurity. We achieved zero knowledge privacy throughrandom masking technique.

It supports batch auditing where TPA will handle multiple users request at the same time whichreduces communication and computation overhead. It usesbilinear signature to achieve batch auditing. It also supportsdata dynamics. It uses Merkle Hash Tree (MHT) for it. We areintroducing Privacy Preserving Public Auditing withwatermark process for secure cloud Storage.

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