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A Secure and Dependable Cloud Storage Service in Cloud Computing

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Abstract: ***Cloud storage is a model of data storage where the digital data is stored in logical pools, the physical storage spans multiple servers (and often locations), and the physical environment is typically owned and managed by a hosting company. These cloud storage providers are responsible for keeping the data available and accessible, and the physical environment protected and running. People and organizations buy or lease storage capacity from the providers to store user, organization, or application data. Cloud storage services may be accessed through a co-located cloud computer service, a web service application programming interface (API) or by applications that utilize the API, such as cloud desktop storage, a cloud storage gateway or Web-based content management systems.***

In this paper, we implement a Flexible Distributed Storage Integrity Auditing Mechanism Using Homomorphic Token Ensuring Security in Cloud. The implemented design enables users to audit the cloud storage with very low communication and computation cost. Taking into consideration that the cloud data are automatic in nature, this design further supports secure and efficient dynamic operations on outsourced data, including block modification, deletion, and append. Analysis shows the proposed scheme is highly efficient and resilient against Byzantine failure, malicious data modification attack, and even server colluding attacks.

Keywords: ***Cloud Storage, Cloud Computing, Authentication, Encryption, Cryptography, Security, Secure Storage System, Data Backup and Restore.***

Introduction:

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. At the foundation of cloud computing is the broader concept of converged infrastructure and shared services.

Cloud computing, or in simpler shorthand just "the cloud", also focuses on maximizing the effectiveness of the shared resources. Cloud resources are usually not only shared by multiple users but are also dynamically reallocated per demand. This can work for allocating resources to users. For example, a cloud computer facility that serves European users during European business hours with a specific application (e.g., email) may reallocate the same resources to serve North American users during North America's business hours with a different application (e.g., a web server). This approach should maximize the use of computing power thus reducing environmental damage as well since less power, air conditioning, rack space, etc. are required for a variety of functions. With cloud computing, multiple users can access a single server to retrieve and update their data without purchasing licenses for different applications.

Cloud storage is based on highly virtualized infrastructure and is like broader cloud computing in

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terms of accessible interfaces, near-instant elasticity and scalability, multi-tenancy, and metered resources. Cloud storage services can be utilized from an off-premises service or deployed on-premises.

Cloud storage typically refers to a hosted object storage service, but the term has broadened to include other types of data storage that are now available as a service, like block storage.

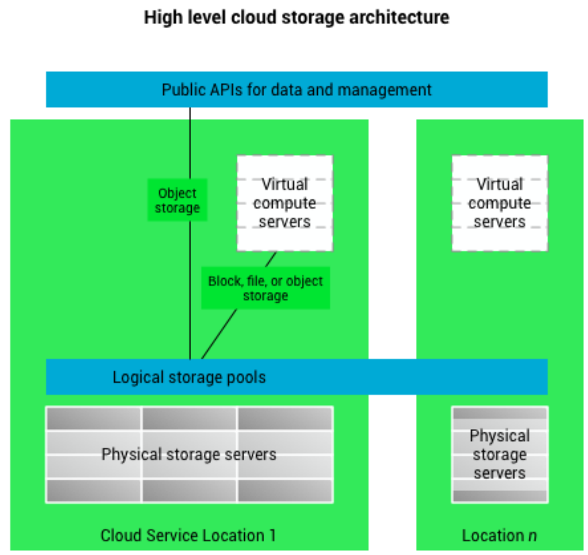
Object storage services like Amazon S3 and Microsoft Azure Storage, object storage software like Openstack Swift, object storage systems like EMC Atmos and Hitachi Content Platform, and distributed storage research projects like OceanStore[5] and VISION Cloud [6] are all examples of storage that can be hosted and deployed with cloud storage characteristics.

Cloud storage is:

Made up of many distributed resources, but still acts as one - often referred to as federated storage clouds
Highly fault tolerant through redundancy and distribution of data

Highly durable through the creation of versioned copies

Typically eventually consistent with regard to data replicas



Existing System:

From the perspective of data security, which has always been an important aspect of quality of service, Cloud Computing inevitably poses new challenging security threats for number of reasons.

1. Firstly, traditional cryptographic primitives for the purpose of data security protection cannot be directly adopted due to the users' loss control of data under Cloud Computing. Therefore, verification of correct data storage in the cloud must be conducted without explicit knowledge of the whole data. Considering various kinds of data for each user stored in the cloud and the demand of long term continuous assurance of their data safety, the problem of verifying correctness of data storage in the cloud becomes even more challenging.

2. Secondly, Cloud Computing is not just a third party data warehouse. The data stored in the cloud may be frequently updated by the users, including insertion, deletion, modification, appending, reordering, etc. To ensure storage correctness under dynamic data update is hence of paramount importance.

Disadvantages of Existing System:

These techniques, while can be useful to ensure the storage correctness without having users possessing data, cannot address all the security threats in cloud data storage, since they are all focusing on single server scenario and most of them do not consider dynamic data operations.

As an complementary approach, researchers have also proposed distributed protocols for ensuring storage correctness across multiple servers or peers. Again, none of these distributed schemes is aware of dynamic data operations. As a result, their applicability in cloud data storage can be drastically limited.

Proposed System:

In this paper, we propose an effective and flexible distributed scheme with explicit dynamic data support to ensure the correctness of users' data in the cloud. We rely on erasure correcting code in the file

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distribution preparation to provide redundancies and guarantee the data dependability. This construction drastically reduces the communication and storage overhead as compared to the traditional replication-based file distribution techniques. By utilizing the homomorphic token with distributed verification of erasure-coded data, our scheme achieves the storage correctness insurance as well as data error localization: whenever data corruption has been detected during the storage correctness verification, our scheme can almost guarantee the simultaneous localization of data errors, i.e., the identification of the misbehaving server(s).

Advantages of Proposed System:

1. Compared to many of its predecessors, which only provide binary results about the storage state across the distributed servers, the challenge-response protocol in our work further provides the localization of data error.

2. Unlike most prior works for ensuring remote data integrity, the new scheme supports secure and efficient dynamic operations on data blocks, including: update, delete and append.

3. Extensive security and performance analysis shows that the proposed scheme is highly efficient and resilient against Byzantine failure, malicious data modification attack, and even server colluding attacks.

Implementation

Modules:

- **System Model**
- **File Retrieval and Error Recovery**
- **Third Party Auditing**
- **Cloud Operations**

Modules Description:

1. System Model

User: users, who have data to be stored in the cloud and rely on the cloud for data computation, consist of both individual consumers and organizations.

Cloud Service Provider (CSP): a CSP, who has significant resources and expertise in building and managing distributed cloud storage servers, owns and operates live Cloud Computing systems.

Third Party Auditor (TPA): an optional TPA, who has expertise and capabilities that users may not have, is trusted to assess and expose risk of cloud storage services on behalf of the users upon request.

2. File Retrieval and Error Recovery

Since our layout of file matrix is systematic, the user can reconstruct the original file by downloading the data vectors from the first m servers, assuming that they return the correct response values. Notice that our verification scheme is based on random spot-checking, so the storage correctness assurance is a probabilistic one. We can guarantee the successful file retrieval with high probability. On the other hand, whenever the data corruption is detected, the comparison of pre-computed tokens and received response values can guarantee the identification of misbehaving server(s).

3. Third Party Auditing

As discussed in our architecture, in case the user does not have the time, feasibility or resources to perform the storage correctness verification, he can optionally delegate this task to an independent third party auditor, making the cloud storage publicly verifiable. However, as pointed out by the recent work, to securely introduce an effective TPA, the auditing process should bring in no new vulnerabilities towards user data privacy. Namely, TPA should not learn user's data content through the delegated data auditing.

4. Cloud Operations

(1) Update Operation

In cloud data storage, sometimes the user may need to modify some data block(s) stored in the cloud, we refer this operation as data update. In other words, for all the unused tokens, the user needs to exclude every

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occurrence of the old data block and replace it with the new one.

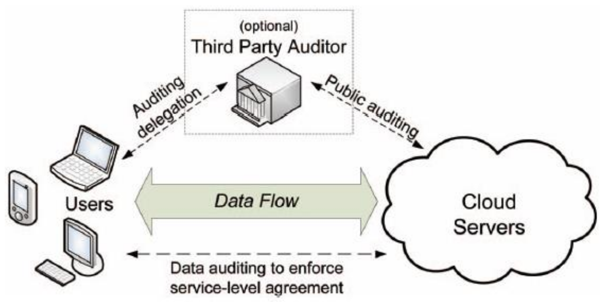
(2) Delete Operation

Sometimes, after being stored in the cloud, certain data blocks may need to be deleted. The delete operation we are considering is a general one, in which user replaces the data block with zero or some special reserved data symbol. From this point of view, the delete operation is actually a special case of the data update operation, where the original data blocks can be replaced with zeros or some predetermined special blocks.

(3) Append Operation

In some cases, the user may want to increase the size of his stored data by adding blocks at the end of the data file, which we refer as data append. We anticipate that the most frequent append operation in cloud data storage is bulk append, in which the user needs to upload a large number of blocks (not a single block) at one time.

Architecture:

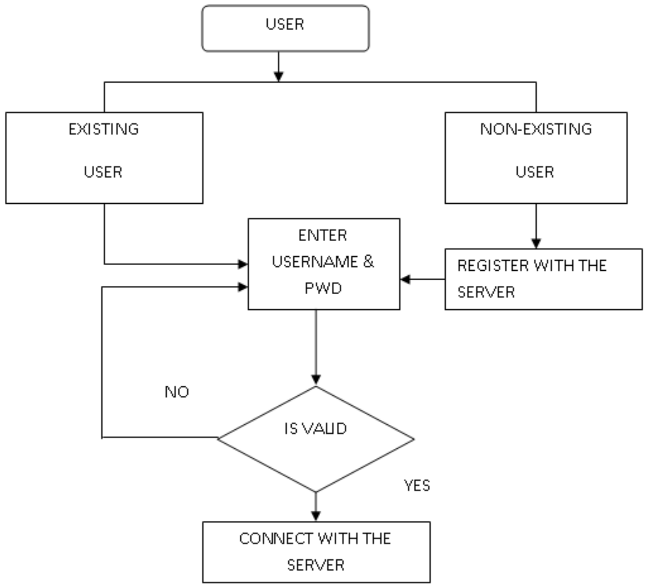


System Design

Data Flow Diagram / Use Case Diagram / Flow Diagram

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of the input data to the system, various processing carried out on these data, and the output data is generated by the system.

DFD Client:



Activity Diagram

An activity diagram is characterized by states that denote various operations. Transition from one state to the other is triggered by completion of the operation. The purpose of an activity is symbolized by round box, comprising the name of the operation. An operation symbol indicates the execution of that operation. This activity diagram depicts the internal state of an object.

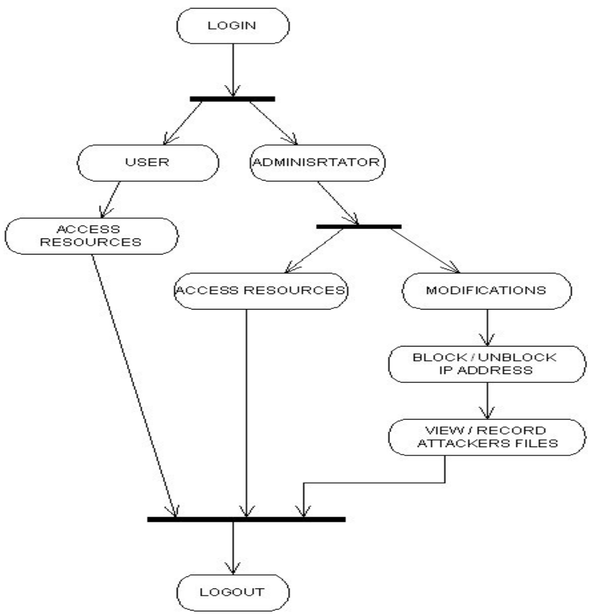


Fig. Activity Diagram

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Conclusion:

To summarize, cloud provides many options for everyday computer user as well as large and small business. It opens up the world of computing broader range of uses and increase the ease of used by giving access through internet connection. However, with this increase ease also come drawback. In this paper we implemented an effective and flexible distributed scheme with explicit dynamic data support, including block update, delete, and append. By utilizing the homomorphic token with distributed verification of erasure-coded data, our scheme achieves the integration of storage correctness insurance and data error localization, i.e., whenever data corruption has been detected during the storage correctness verification across the distributed servers, we can almost guarantee the simultaneous identification of the misbehaving server(s)If you are considering using cloud, be certain that you identify what information you will be putting out in cloud, who will have access the information and what you will you need to make sure it is protected. In future, we will extend our research by deploying an application in own cloud and also by providing security and backup to justify our concepts of security for cloud computing.

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