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Multiuser Storage and Data Access Optimization

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Abstract: Cloud storage has come to be quite prevalent in recent year, but the storage of duplicate files on the cloud is excessively problematic which leads to depletion and wastage of the resources. The additional concern organizations migrating to cloud storage have is with data integrity and secure access of data. There are various ways with which duplication can be reduced but these methods are mostly limited to single user. We propose a secure multi user deduplication system with a multilevel architecture which will optimize data access along with deduplication, data integrity and security. The multiuser deduplication will improve multiuser storage and the access to data is optimized by introducing a hierarchical system which can be customized by the user's organization as they see fit.

Keywords: Cloud Computing, Multi-user storage, Data access optimization, Proof of Storage.

1. INTRODUCTION

The cloud storage has become very popular with industry as well as academic organizations due to its cost effectiveness, easier accessibility and efficient sharing. The cloud storage is purchased by an organization from a third party cloud provider. Many companies such as Google, Amazon and

Microsoft provide the cloud services.
Outsourcing the storage helps the organization cut the cost, but when duplicate files are stored on the

cloud the resources are wasted. There exists various systems which help in deduplication but there are not many systems that introduce that in a multiuser environment.

The Proof of storage is one such method that helps with deduplication. The user can obtain the file ownership without actually uploading the file. The Proof of storage is further improved when dynamic proof of storage is introduced but the dynamic proof of storage is limited to single user environment.
The intended system proposes a system with dynamic deduplication using dynamic proof of storage in a multi user environment with the help of a multilevel data access optimization. The Dynamic proof of storage in multiuser environment will help with reducing the duplication and the multilevel environment will improve with ease of access and sharing.
Scope: The system is useful for social networking sites or any organization using a cloud based environment. It can handle several users uploading a great amount of information simultaneously. It helps in managing cloud storage while not making duplicate copies and provide secure access to data.

2. PROPOSED SYSTEM

The existing systems lack dynamic operations in multiuser deduplication. The proposed system not only overcomes this limitation but also enhances the system significantly.

The multiuser storage is improved via de duplication and the access to data is optimized by introducing a hierarchical system which can be customized by the user's organization as they see fit.

The proposed custom structuring of hierarchy allows the creation of a Multi-Level Data access model where allotment of permission to access a file associated to a group is automated while preserving the original user access rights and benefits.

This Multi-Level Structure is achieved in this proposed system by introducing the attribute tag generation during the initial stage of the system. The attributes are organization based and customizable. Various rights associated to the access of files are pre-programmed to the attributes that allow automated level access to files additional to the multi user access.

As depicted in fig.1 a structure custom designed for a school based system has attributes such as 'P' for principal, 'T' for teacher and 'S' for student.

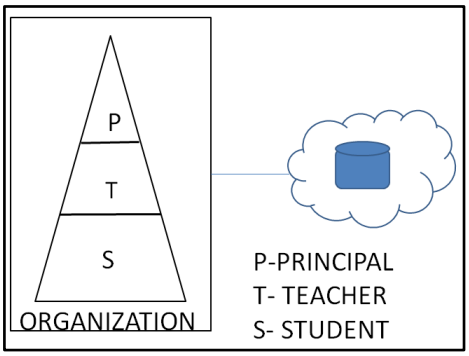

Fig.1 Multi-level structure, example school system

The various stages in the system are:

2.1The initial stage

In this stage the user decides to upload a file on the cloud along with an attribute. The cloud system decides if the file should be uploaded or not. If there doesn't exists a same file on cloud then the file is uploaded or else it goes to De-duplicate stage. It is decided by the system if the file should be uploaded or not.

2.2 The upload stage

The files that are to be uploaded on the cloud are uploaded if there doesn't exists a same file, or it goes to the de-duplicate stage. If there doesn't exists a same file then the file is normally uploaded to the cloud and the original user is the owner of the file. The user can access and modify the file. The files uploaded on the cloud could be accessed by other users based on the privileges of the user trying to access it.

2.3 De-duplicate stage

If a file already exists on the cloud, the file is not uploaded on the system instead the system gives the user access (pointer) to the existing file. This is the most important stage where in the user gets the access/ ownership of the existing file.

2.4 Modify stage

Any user can modify their file, in that case a new file will be created since there no longer exists duplicate files.

2.5 Data access stage

In this state the user can access their files as the owner of their file. The original user can access the file as they own the file but the subsequent users can access the file since they too have the ownership of the file, since they passed the De-duplicate stage.

The other part of data access is where the users who did not upload the file but have got the permission via hierarchical system can access the file too but may not be able to modify it.

The data access is optimized by the introduction of the hierarchical system.

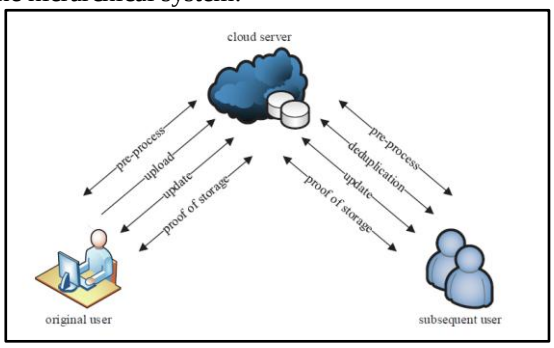

Fig.2 System architecture

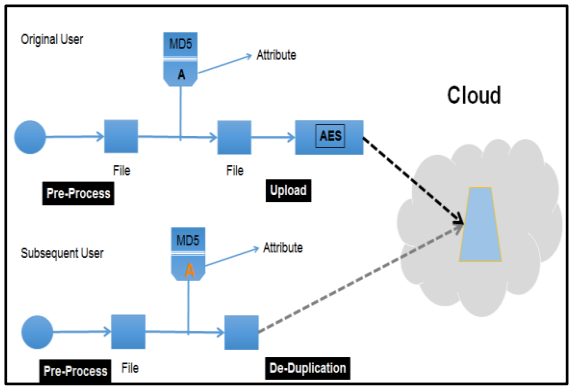

Fig.3 Project Working

3. ALGORITHM

The Multi-user Storage and Data Access Optimization (MSDAO) algorithm:

The MSDAO algorithm improves the system integrity and data access optimization. It introduces a multilevel hierarchical system in a multi user dynamic deduplication system.

The MSDAO algorithm is as follows:

A. Pre-process stage-

a. Accept the file from user X for pre-processing.
b. Accept user attribute parameter u, Permission parameters r,w,x.
c. call function MD5(u,r,w,x) and generate ID_tag-{hash, attribute, permissions}.
B.Upload stage-
if(id_Tag not in file_table)
Encrypt file with AES Algorithm and upload on cloud server.
else
Goto Deduplication stage
C.Deduplication stage –
Provide POS pointer to user for that file &Goto Proof of storage stage.
D.Update stage-
Goto Pre-process stage.
E.Proof Of storage –
if (user has POS pointer)
Provide user the requested file ownership.

The proposed system also considers and enhances the data integrity and security along with improving the storage and access.

4. CALCULATION

Pre-Process Phase

a ← Hash(file), id ← H(en_key).

Where,

id = File Identity.

Upload Phase

File = (m1, . . . ,mn).

The user first invokes the encoding according,

(C, Tb) ← En (en_key, file)

Where,

m1, . . . ,mn= Represents I^{th}block of file.

en_key = Encryption key.

En=encode

The Deduplication Phase

If a file announced by a user in the pre-process phase exists in the cloud serer, the user goes into the deduplication phase and runs the deduplication protocol

res∈ {0, 1} ← Deduplicate{U(en_key, file), S(Tb)}

Where,

res = Current uploading file.

En_key = Encryption Key.

File= Uploaded File.

The Update Phase

In this phase, a user can arbitrarily update the file, by invoking the update protocol

res∈ {he∗, (C∗, Tb ∗)i,⊥} ← Update{U(en_key, ι,m,OP), S(C, Tb)}

Where,

res= Current updating file.

S(C, Tb) = block to be uploaded.

The Proof of Storage Phase
At any time, users can go into the proof of storage phase if they have the ownerships of the files. The users and the cloud server run the checking protocol
res∈ {0, 1} ←Check{S(C, Tb), U(en_key)}
Where,
res =Current file.
S(C, T) = Block of file.

CONCLUSION

The proposed system enhances the existing system by including the dynamic POS in a multiuser system and further improving it with the multi-level hierarchical system which helps in data access optimization. The MSDAO algorithm is introduced and theoretically is efficient and useful in Multiuser storage and data access optimization. The proposed system also considers and enhances the data integrity and security along with improving the storage and access.

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