Shared Cloud Object Store, governed by permissioned blockchain

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CCS CONCEPTS

• **Computer systems organization → Cloud computing**;

1 SYSTEM DESCRIPTION

Introduction. We present a design of the Shared Cloud Object Store, in which the data access control plane is governed by Hyperledger Fabric (HLF) [2]. Our system facilitates decentralized management of cloud storage, shared between mutually distrusting business parties. Finally, we leverage the cloud object store (COS) to store the objects off-chain, anchoring the proof-of-retrievability inside the blockchain, preventing ledger to scale to unmanageable size.

Background. Cloud platforms provide flexible identity and access management, enabling data sharing between different cloud accounts. However, this access control management model is inherently centralized, since sharing policies are governed by a single cloud account. Therefore, the information shared on the COS is dependent on a single account owner despite being related to multiple parties. Storj [3] mitigates this concern by building a blockchain based peer-to-peer cloud storage. Blockstack [1] decouples the control and data planes, and comprises the control plane upon a blockchain, thereby facilitating decentralization of trust. Both Storj and Blockstack either had to develop a data access layer or significantly extend existing cloud storage platforms. An additional concerns, is that storing the documents on the blockchain is not very efficient, eventually leading to blockchain bloat [4].

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Proposed solution. We strive to leverage the HLF blockchain platform to serve the purpose of the access-control moderator for shared COS, while using cloud storage as an off-chain solution. Parties interested in a shared storage space on the cloud form a consortium of organizations, spanning the HLF network with chaincodes to encode access policies. The execution flow outline:

(1) Client submits transaction, providing object metadata, based on an endorsement policy
(2) Chaincode verifies the access policy of said client with respect to the object and its meta information
(3) Upon reception of a valid endorsement response, which contains an access token, the client uses the token to place the object in a staging area
(4) Client submits the transaction with the endorsement response to the ordering service
(5) While committing the transaction peers use *custom* verification system chaincode ensuring integrity
(6) After the transaction is committed, the object moves from staging to permanent storage, otherwise it is discarded

Summary. 1) Design of the Shared COS architecture, augmented with an ability to setup a consortium of business parties willing to maintain shared data store in the cloud. 2) Addressing the "blockchain bloat" problem by profiting from the coupling between COS and blockchain, maintaining object metadata in the blockchain while the object itself resides in the COS.

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