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### Patent Search

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#### Abstract:

The present invention relates to a blockchain-based cloud storage system that enhances data security, privacy, and integrity through the integration of decentralized advanced encryption, and smart contract technology. This system securely stores user data off-chain while recording essential metadata, including cryptographic hash access controls, on a blockchain ledger. The data is encrypted using a dual-layer approach, employing symmetric encryption for the content and asymmetric encryption management, ensuring that only authorized users can access and decrypt the data. By leveraging decentralized storage solutions, the system provides scalability and reducing the risk of data loss and unauthorized access. The incorporation of smart contracts automates user authentication and access control, creating a tamper-proof environment for secure data management. This invention addresses the critical challenges of traditional cloud storage systems, offering a robust

#### Complete Specification

Description:[001] The present invention pertains to the field of data storage systems, specifically focusing on enhancing the security and integrity of cloud-based storage through the integration of blockchain technology. It addresses the growing need for decentralized, secure, and reliable storage solutions capable of protecting sensitive data from unauthorized access and cyber threats. The invention introduces a blockchain-based architecture for cloud storage, which incorporates advanced encryption techniques to ensure that data remains encrypted during both storage and retrieval processes.

[002] Furthermore, this invention relates to the use of smart contracts within the blockchain framework to manage access controls and verify user authentication. The system not only guarantees the secure storage of data but also facilitates efficient retrieval of encrypted data by authorized users. By leveraging decentralized storage mechanisms such as blockchain for metadata and off-chain solutions for large-scale data, the invention, Claims:1. A blockchain-based cloud storage system comprising decentralized blockchain ledger configured to store metadata related to user data, including cryptographic hash values, ownership details, and access control rules; b. an off-chain decentralized storage mechanism for securely storing encrypted data; c. an encryption module configured to encrypt user data using symmetric and asymmetric cryptographic methods; d. a smart contract framework for managing user authentication and access control to the stored data.

2. The system of claim 1, wherein the encryption module employs AES-256 for symmetric encryption of the user data, and RSA or Elliptic Curve Cryptography for asymmetric encryption of the symmetric encryption key.

3. The system of claim 1, wherein the off-chain decentralized storage mechanism is based on peer-to-peer storage solutions, including but not limited to the InterPlanetary File System (IPFS).

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