

## A Blockchain-Based Decentralized File Security System for Tamper-Proof Data Storage

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### Abstract:

This paper presents a decentralized and secure file storage framework that leverages Advanced Encryption Standard (AES) encryption, InterPlanetary File System (IPFS), and the Polygon blockchain to address the limitations of conventional cloud storage systems. Unlike traditional centralized approaches that are prone to single points of failure, unauthorized access, and data tampering, our model ensures confidentiality, immutability, and verifiable ownership of digital assets. The system encrypts files at the client-side before upload, thereby guaranteeing data privacy even in distributed storage environments. Encrypted files are stored on IPFS, while metadata including file hash, uploader identity, and timestamp is permanently recorded on the Polygon blockchain via smart contracts, ensuring transparency at low transaction costs. A React.js-based frontend integrated with MetaMask provides a user-friendly interface for secure file upload, retrieval, and verification. Experimental deployment on the Polygon Amoy testnet demonstrates the feasibility of the proposed system in achieving low-cost, tamper-proof, and privacy-preserving storage, outperforming Ethereum-based counterparts in terms of scalability and gas fees. This framework supports applications across industries such as healthcare, legal, education, and enterprise data management, offering a practical, modular, and future-ready solution for decentralized storage.